NIGERIA

Annual Report on the Agricultural Department for the year 1948

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FOREWORD

Important legislation destined to have far-reaching effects on Nigerian Agriculture was enacted in 1948. The Agriculture Ordinance No. 37 of 1948 embraced under one bill all previous Agricultural enactments and brought them up to date. An important clause of the bill provided for the establishment of a Board of Agriculture with an unofficial majority, consisting of the Director of Agriculture (Chairman), the Director of Veterinary Services, the Chief Conservator of Forests, the Registrar of Co-operative Societies, and nine nominated members representing the three Administrative Regions and the Colony of Lagos.

Plans were made by Government for the establishment of Marketing Boards in respect of groundnuts, cotton and palm products. The ordinances providing for their establishment were approved by regional legislative bodies. Provision in the bills allow for the formation of regional production development boards. A statement of Government policy in respect of these new bodies was issued as Sessional Paper No. 18 of 1948.

Decision was taken for the establishment of an Agricultural Engineering Branch of the Department, the early concern of which will be with experiments in the mechanisation of Agriculture in the interest of increased production. The programme for the Northern Provinces is outlined in the section of the report for that region.

Particular attention has been devoted to the maintenance of soil fertility, and to this end important experiments with commercial fertilisers were continued and increased in number. These are described in the Chemistry section of the report. There is no doubt that the programme for extension of the use of fertilisers and the experimental work on mechanisation are of the utmost importance to Nigeria at the present time.

A promising feature of the work of the Department's Agricultural Schools is evidenced by the fact that increasing numbers of advanced students are being selected each year for overseas scholarships in Agricultural subjects, most of whom are taking degree courses.

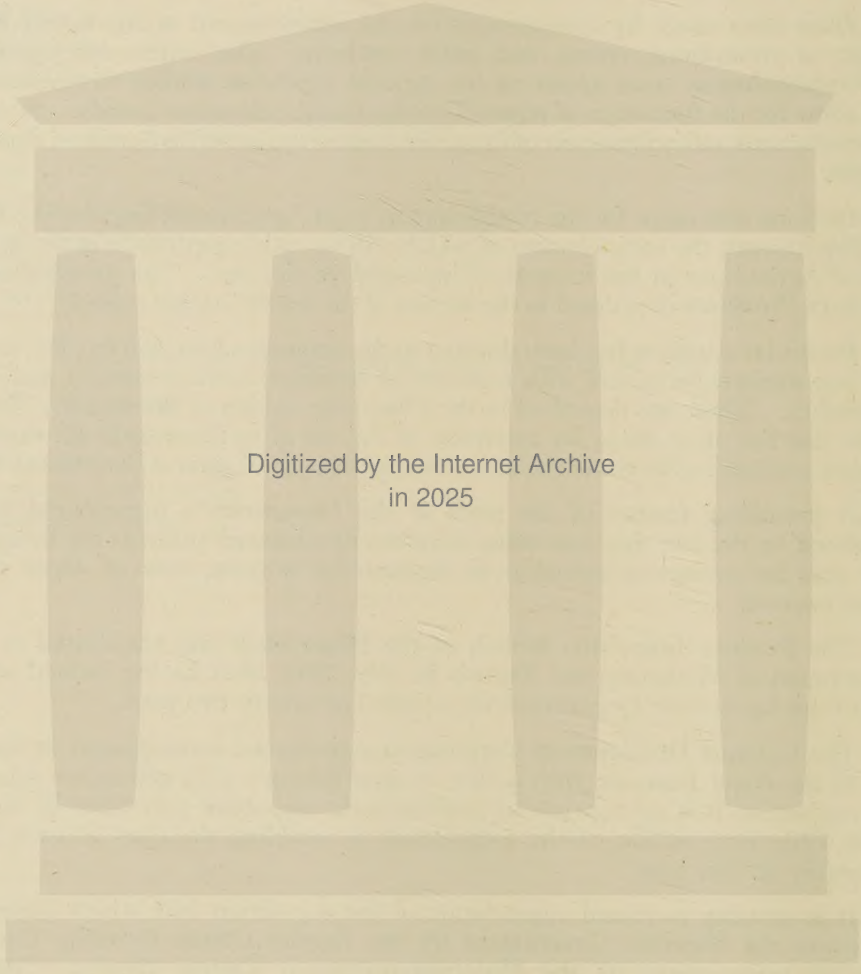
The Produce Inspection branch of the Department was transferred to the new Department of Marketing and Exports in July, 1948, after having formed an integral part of the Agriculture Department for a period of twenty-two years.

The Colonial Development Corporation commenced investigations in the Mokwa area of the Niger Province with a view to establishing a pilot groundnut scheme. In this connection it is appropriate to emphasise the important part taken by the officers of the Chemistry section of the Department in enabling the Clay Mission to report favourably on this area.

It is pleasing to record appreciation of the expedition with which assistance was offered to the Nigerian Government by the Empire Cotton Growing Corporation, following upon report by the Hutchinson-Pearson Cotton Mission. Mr Q. A. Geering, Entomologist, arrived in Nigeria, and plans were made for the transfer to Nigeria of Mr H. E. King, a plant breeder from Uganda. These additions to the much depleted ranks of specialist staff working on cotton problems, are most welcome.

Three missions with special terms of reference visited Nigeria in 1948, to make inquiries concerning Rice Production, Mechanisation of Agriculture, and the Livestock Industry.

A. G. BEATTIE,
Director of Agriculture



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I. Report of the Agricultural Department, Northern Provinces, for the year 1948

GENERAL

No improvement in the staff situation can be recorded during 1948 and shortage of qualified Senior Service Staff continued to be one of the principal factors limiting agricultural development. The recruitment of qualified officers fell short of normal wastage and only one Agricultural Superintendent was appointed against the loss of one Senior Agricultural Officer and one Agricultural Officer. As a result of the urge from all quarters for speed in agricultural development throughout the Region, members of a staff already inadequate in numbers are having to shoulder increasingly heavy burdens, and although they continue to tackle their many commitments with energy and vigour, it is impossible for them to devote the time and attention, necessary for efficiency and effectiveness, to all lines of work. Field experiments and agronomic investigations, in particular, although continued at all Experimental Farms and Farm Centres, have, in recent years, had to suffer in this respect. Extension of research work, particularly on the many problems connected with the maintenance of soil fertility is urgently needed, for the development programme involving, as it does, substantial increases both in the tempo of land exploitation, and in productivity of the soil, is bound to create new and difficult problems.

Special attention was paid during the year to two lines of work which offer the best prospects for substantial and rapid increases in productivity, *viz.*, the use of artificial fertilizers and mechanisation of agriculture. Spectacular results to which reference is made in the Chemistry section of this report, were obtained with trials of artificial fertilizers, and there are good prospects of rapid development in the use of these by peasant cultivators. The slow delivery of tractors and implements limited progress in mechanisation, but plans have been made for a comprehensive programme of investigations as soon as the machinery and equipment on order arrive.

Three missions, appointed by the Secretary of State to advise on matters connected with agricultural development, visited the Northern Provinces during the year. The first of these was concerned with expansion of rice production, the second with mechanisation of agriculture and the third with the livestock industry. The only report issued by the end of the year was that of the Rice Mission, which is under consideration by Government.

THE SEASON

2. Abnormal distribution of the rains, their abrupt termination and the early onset of harmattan, were the main features of the 1948 season. In the Northern belt total rainfall was generally a little short of average but was above average in Bauchi and Sokoto Provinces. Adequate early rains were followed by a six weeks drought and, later in the season, heavy August and September rains caused flood damage to rice and water logging of other crops in several provinces, including Sokoto and Katsina. In most areas of the Southern belt, total rainfall for the year was substantially below average, due to an extended short dry season and to the early cessation of the rains.

Generally, the season was not a favourable one for staple grain crops, and yields were below average to varying degrees, except in Sokoto and parts of Katsina, where the guinea corn crops was reported to be up to average. Provincial reports indicate that grain crops suffered most in Zaria Province, where guinea corn was estimated to be

about 75 per cent of normal, and in Plateau Province where the Acha (*Digitaria sp*) crop of the uplands and guinea corn throughout the province, were thought to be 60 per cent and 70 per cent of average respectively. While it is possible that the reduced yields of the 1948 crop may cause temporary difficulties in the food situation in 1949 in Plateau Province, which normally requires to import large quantities of grain, no serious food shortages are anticipated. Food supplies during 1948 were adequate but prices generally were on a high level.

Typical rainfall records are shown below :—

NORTHERN BELT

	Bauchi		*Kafinsoli*		*Samaru, Zaria*	
	1948	*Average 12 years*	1948	*Average 17 years*	1948	*Average 25 years*
	ins.	*ins.*	*ins.*	*ins.*	*ins.*	*ins.*
January	—	—	—	—	—	Trace
February	0.11	0.01	—	—	—	0.04
March	—	0.07	—	Trace	0.19	0.34
April	2.42	1.79	1.09	0.29	3.53	1.33
May	2.20	3.28	1.37	2.64	2.98	4.98
June	12.87	6.48	5.81	4.19	5.05	6.63
July	7.63	10.00	5.47	7.79	5.31	8.76
August	15.51	15.42	12.83	11.10	8.34	11.92
September	7.13	7.70	4.19	5.64	9.77	8.65
October	0.21	1.87	—	0.44	—	1.42
November	—	0.15	—	—	—	0.03
December	—	0.01	—	—	—	Trace
TOTAL	48.08	46.78	30.76	32.09	35.17	44.10

SOUTHERN BELT

	Ilorin		*Yandev-Benue*		*Bida-Niger*	
	1948	*Average 44 years*	1948	*Average 21 years*	1948	*Average*
	ins.	*ins.*	*ins.*	*ins.*	*ins.*	*ins.*
January	—	0.22	—	0.33	—	—
February	0.36	0.70	0.01	0.73	—	0.35
March	1.23	2.09	—	1.38	2.98	1.61
April	6.12	4.41	5.50	4.07	4.36	1.11
May	6.17	6.59	6.64	6.97	7.04	5.60
June	6.66	7.65	5.93	7.57	9.08	7.29
July	2.82	5.32	2.11	4.98	8.53	7.31
August	4.25	4.90	10.64	6.74	7.37	8.78
September	5.64	9.47	8.00	11.00	7.77	9.71
October	6.49	6.91	2.28	8.87	0.41	4.33
November	0.58	1.22	1.51	0.56	—	0.42
December	—	0.28	—	0.17	—	0.01
TOTAL	40.32	49.49	42.62	53.37	47.54	46.52

3.—MAIDUGURI AND YOLA STOCK FARMS

Steady progress in the building up of foundation herds of dairy cattle at the new Provincial Stock Farms at Maiduguri and Yola has been made during the past two years. At Maiduguri, two Bornu breeds of cattle, the Shuwa and the Chad, are being used for breeding and selection, and, at Yola, work is being carried out with Adamawa breed. Spectacular success has attended the policy pursued at Maiduguri, where breeding stock is tested for milk before purchase, and high prices are paid for cows of exceptional merit. The highest recorded Nigerian lactation of 7,543 lb was recorded during the year at Maiduguri by a cow of the Shuwa breed. This compares with the two previous best lactations recorded at Shika Stock Farm as under.

1947 6,935 lb in 356 days—Koran cow purchased at Maiduguri.

1936 5,805 lb in 322 days—Sokoto cow purchased at Sokoto.

It is of interest to compare the outstanding lactations of the year at Adamawa and Bornu with those of Shika Stock Farm.

SHUWA HERD—MAIDUGURI STOCK FARM

Cow No.	*Lactation No.*	*Total Yield*	*Yield in 305 days*	*Lb. per day between Calves*	
F 89	6	7,543	7,108	16.2	
F 13	4	5,241	5,241	16.6	(Cross-bred Chad-Shuwa)
F 16	1	3,806	3,806	11.9	

CHAD HERD—MAIDUGURI STOCK FARM

Cow No.	*Lactation No.*	*Total yield*	*Yield in 305 days*	*Lb per day between Calves*	
32	6	5,381	5,360	16.8	(Cross-Bred Chad-Shuwa)
3	7	3,640	3,640	8.3	
34	2	3,443	3,411	5.2	

ADAMAWA HERD—KOFARA STOCK FARM, YOLA

27	—	4,113	—	8.7	
20	—	3,723	—	7.8	
14	—	3,397	3,397	9.5	

SOKOTO HERD—SHIKA STOCK FARM

211	2	4,402	4,259	6.41	
217	3	3,971	3,972	11.96	
219	3	3,518	3,426	10.59	

WHITE FULANI HERD—SHIKA STOCK FARM

408	4	4,144	4,057	8.76	
392	5	3,431	3,377	7.08	
369	6	3,426	3,426	8.91	

Although Chad cows have given excellent milk yields at Maiduguri, the breed does not appear to thrive outside its natural habitat near Lake Chad.

SHIKA STOCK FARM

4. Shika Stock Farm experienced a very bad season. Unusually early rains were followed by a six weeks drought, which inhibited the early flush of grass in May. Rains terminated abruptly in September, and the grazing dried out rapidly under the influence of the early harmattan. These conditions considerably aggravated the feeding problem, a problem already serious owing to the overstocking of the farm which resulted from the restrictions imposed upon the annual dispersal of surplus stock by the presence of contagious abortion. Under these critical conditions, an outbreak of trypanosomiasis in September spread rapidly through the herd; the incidence of positively confirmed cases stood at 20 per cent by the end of November. In spite of the segregation of positive cases and resort to slaughter in the more severe cases, the epidemic continued its course throughout the dry season. The extremely high incidence, together with the relatively high percentage of T. Congolense cases, marks the severest epidemic yet experienced at the stock farm, and it is feared that losses will be heavy.

No positive case of contagious abortion was confirmed by the agglutination test during 1948, although a total of 782 blood tests were carried out during the period. This result is difficult to reconcile with an incidence of over 50 per cent in 1947. A total of 513 head of stock received contagious abortion vaccine S. 19 during the year, and it is expected that the whole herd will have been immunised by the middle of 1949. Trypanosomiasis was held responsible for an increase in the number of abortions. during the last four months of the year. Abortions totalled twenty-two during 1948, out of 183 calvings. Calf scour was much more serious during the period, and this disease was mainly responsible for the significant increase in the mortality percentage from 11.11 to 19.38.

Fifty-seven head of stock were issued to other stations during the year, but 150 head of surplus stock, due for dispersal in September, were held up pending negative reactions from three successive contagious abortion tests.

The breeding policy laid down in 1947 with regard to inbreeding was continued. 25 per cent of the cows of the two main strains of the White Fulani Herd, Nos. 2 and 4, are being inbred, whilst the remaining cows of these strains are outcrossed. Similarly, dams of all other White Fulani strains are outcrossed as far as this can be arranged. In the Sokoto herd, only the daughters of Stock Bull No. 17 are being inbred, by mating with their sire or to his son, Stock Bull No. 26. It will not be possible to assess the effect of this policy of inbreeding for several years, but, in the interim, all animals of inferior confirmation will be rigorously culled. The year's lactation records again confirm the capacity of White Fulani Stock Bull strains 2 and 19 to transmit to their offspring the factors for high milk yield. Two of Stock Bull No. 19's daughters yielded over 400 gallons, one of them yielding 4,863 lb in 358 days. The lactation average of both herds shows a small but probably insignificant increase for 1948. The introduction of a minimum service period of ten weeks appears to have affected the herd average for " period—between—calves " as the following table shows :—

White Fulani Herd			Sokoto Herd		
Year	*Average yields in lb*	*Average No. days between calves*	*Year*	*Average yield in lb*	*Average No. days between calves*
1944 ..	1,758	387	1944 ..	1,609	398
1945 ..	2,134	387	1945 ..	2,313	429
1946 ..	2,336	378	1946 ..	2,727	390
1947 ..	1,822	348	1947 ..	2,052	378
1948 ..	2,206	374	1948 ..	2,363	407

ILORIN STOCK FARM

5. Reference was made in last year's report to the losses incurred amongst animals from all three herds, isolated outside the farm on account of contagious abortion. After the rains there was a marked improvement in the condition of the survivors, and this was maintained into the dry season. Two agglutination tests, carried out at the end of the year, gave completely negative reactions and the herd is now considered free from contagious abortion. Losses, due to trypanosomiasis, totalled eighteen, the relative percentage mortality rate between the three herds being Gold Coast Shorthorn 2.6 per cent, N'dama 3.5 per cent, N'dama-Borgawa crossed 8.3 per cent. The cattle population on the stock farm at the end of the year was 217.

The N'dama Longhorn herd again maintained its good conditon, although the percentage of animals showing Trypanosomiasis infection increased to 25.7 per cent compared with 14.1 per cent in 1947. The following table gives a comparison between the three herds :—

	Percentage infection by Tryps only		*Percentage cases requiring treatment or ending fatally*	
	1947	1948	1947	1948
All classes	32.2	30.0	22.9	25.0
Gold Coast Herd	41.7	37.3	27.8	24.0
N'dama Herd	14.1	25.7	11.2	10.8
N'dama-Borgawa	41.8	26.6	20.9	31.6

The shy breeding habit of the N'dama breed has been commented upon in previous reports. The number of days between calves for cows of the three herds which calved down in 1948 are given below. The range for N'dama cows was from 351 days to 645 days.

Class of Stock	*No. of Cows Calving*	*Average No. of days between Calves*
Gold Coast	6	426
N'dama	18	444
N'dama-Borgawa crosses ..	8	463

GENERAL

6. The policy of grading the Nigerian Shorthorn herd at Yandev, in Benue Province, by the use of an N'dama bull was continued, and cross-bred calves, averaging 28 lb at birth, are 15 per cent heavier than average dwarf shorthorn calves. Arrangements have been made with the Institute of Tsetse Research and the Veterinary Department to carry out a comparative test of tolerance to trypanosomiasis of pure bred N'dama and Zebu cattle, and Samaru bred N'dama/Zebu crosses.

MIXED FARMING

7. Shortage of ploughs continued to be a limiting factor to the number of mixed farmers set up during the period. Substantial numbers of ploughs, however, began to arrive towards the close of the year, although too late to equip a large proportion of applicants for the 1948 farming season. With some 4,500 ploughs expected to reach this country within the next eighteen months, the supply position, for the first time during the post-war period, may now be regarded as satisfactory. There was a net increase of 652 in the number of practising mixed farmers, 1,018 new farmers having

been set up, and 366 closed down. The greatest net increases occurred in Katsina (210), Kano (147) and Sokoto Province (117), but substantial progress was also made in Bauchi and Plateau Provinces. Thirty-four mixed farmers were set up in Adamawa for the first time. The total number of practising farmers at the close of the year was 4,720, and the rate of expansion over five year periods since 1928 is shown below.

1928	3
1933	173
1938	1,598
1943	2,125
1948	4,720

Although there can be no doubt about the popularity of mixed farming in those areas where the practice is firmly established, the rate of expansion in numbers must necessarily continue to be related to the amount of supervision it is possible to afford new entrants, and to the numbers of suitable cattle that can be purchased and trained. The shortage of ploughs and the high prices ruling for fat stock have encouraged a class of professional feeder, and appreciable numbers of mixed farmers have made substantial profits from the fattening of oxen. Where a farmer is able, and can be relied upon, to purchase his own replacements, the practice has everything to commend it but, where cattle are in short supply, it is obvious that the working cattle requirements of new entrants must take precedence over replacements for the fat stock trade. The extension of stock breeding by the farmers themselves, which is being given every encouragement, should eventually solve the problem of numbers, but the supply of suitable cows which falls far short of the present demand is the main limiting factor to progress in this direction. An encouraging feature in some areas is the gradual increase in the number of farmers who purchased their own replacements and, in Kano Province, it was only necessary for us to purchase 786 head of cattle compared with 934 in 1947.

CATTLE AUCTION SALES

8. The weekly auction of cattle at Kano, run in collaboration with the Veterinary Department was patronised, almost exclusively, by mixed farmers from Kano and Katsina Provinces, and stall feeders from Azare in Bauchi Province. Altogether 654 animals, valued at £9,525, were sold compared with 581 beasts, valued at £6,890, in 1947. The value of high grade cattle is enhanced by the priority in allocation of wagons given by the railway to fat stock for the Lagos market. The following figures show numbers, quality and price trends since 1946.

	Herd of Stock			*Pence per lb liveweight*		
	1946	1947	1948	1946	1947	1948
				d	d	d
Very Fat	6	18	49	3.30	4.28	4.83
Fat	133	205	89	3.04	3.77	4.39
Forward Stores	164	267	516	2.86	3.45	3.55
Stores	40	46	—	2.17	3.21	—
Total	345	536	654			

The Nigerian Local Development Board approved a free grant of £4,650 and a loan of £1,500 to the Katsina Native Administration for the establishment of a cattle market at Funtua, to which the Nigerian Railway will provide a siding and loading ramp. This will replace the present auction market at Daudawa.

DAIRYING

9. Reference was made in last year's report to the dairy farmers of the closely farmed area around Kano City. Shortage of fodder and of cows prevented any large scale expansion, but 3,900 gallons of milk, valued at £488, were distributed to Kano consumers. Total sales from the Government dairy are valued at £877 and included 6,400 gallons of skim milk, 340 gallons whole milk, 2,566 lb of butter, and substantial quantities of cream and cheese. The turnover of the Native Administration dairies at Okene and Kabba increased by 13 per cent during the year ; the equivalent of some 4,500 gallons of milk was retailed as cream, butter, and fresh milk. Zaria dairy had a difficult year, due to the increasing demand for the available milk, but 6,270 gallons of fresh milk and 470 gallons of cream were retailed. Sales at Maiduguri totalled 4,400 gallons of milk and 60 gallons of cream.

PIGS

10. Although output from departmental piggeries increased substantially during the year, the demand for bacon pigs continues to expand. Railings to Lagos under the aegis of the Department, for processing into bacon, totalled 5,140 pigs compared to 2,798 a year ago. Of this total, 2,139 came from private piggeries, including 1,350 from a private piggery at Kano. Of the 3,001 fattened at Departmental piggeries, 481 weaners were obtained from Anchau Settlement, and 285 from breeders in Bauchi Province. In addition to the pigs railed, over 300 were slaughtered locally to augment pork supplies.

In Jema'a Emirate of Plateau Province a considerable pig industry has developed from Southern Zaria piggery bloodstock, and some 2,000 pigs were railed in 1948 mostly to the Eastern Provinces.

Shika Stock Farm supplied a total of 101 breeding stock to various breeders.

GOATS AND SHEEP

11. There has been a marked improvement in the health and reproduction of goats and sheep in the small departmental flocks since attempts to maintain them under intensive management were abandoned. To illustrate the beneficial effect of open range management, the reproduction indices of the Yandev flocks are given below.

	1945	1946	1947	1948
	per cent	*per cent*	*per cent*	*per cent*
Sheep	46.7	59.1	54.2	104.6
Goats	29.4	100	100	175

FODDERS AND PASTURES

12. Small scale work in connection with dry season fodders was continued during 1948. At the Bornu Stock Farm 130 tons of silage were successfully made at a cost of 3s 4d per ton which may be regarded as very satisfactory, 45 tons of this were made from sweet sorghum grown for the purpose, and the remainder from natural grass. At Sokoto, bush grass silage proved more palatable to stock than a mixture of grass, sunflower, grain and cowpeas. Lucerne was established on a small scale at Sokoto and set seed successfully. At Maiduguri this crop yielded 13,000 lb of green fodder per acre when irrigated twice weekly, compared with 20,000 lb per acre in 1947 when it was irrigated four times weekly.

The collection and observation of indigenous grass species has continued at the Botanists' Farm, and at one or two of our main stations. Treatment and management experiments of natural and established pastures were carried out on a small scale at Ilorin. Stock carrying capacity investigations were initiated at Shika and Riyom, and were continued at Ilorin. In artificial manurial trials at Ilorin the response of grass to nitrogenous and phosphatic manures, and especially in combination, was demonstrated. At Yandev a new techinique for establishing Gamba (*Andropogon sp.*) as a fallow has been evolved. Previously root stocks of Gamba grass were planted immediately after the wet-season benniseed was harvested. It has been shown, however, that Gamba seed may be broadcast along with the benniseed and that the Gamba can be established in this way, with no depressing effect on the yields of the benniseed crop. Kyasuwa (*Pennesetum sp.*) was grown at several stations as a hay crop, and yielded well. Work on grass fallows continued at Yandev, Maigana, and Zonkwa, and an extended programme has been arranged for 1949.

Present trends of agricultural development emphasise the urgent need for adequate research with regard to the establishment and maintenance of pastures, and with regard to the role grassland should play in the future of the Region's agriculture. Under systems of mechanised farming, grass fallows, or temporary leys, must assist in the maintenance of soil fertility. Reports of over-stocking and consequent grassland retrogression come from several provinces, even in pastoral regions. Unfortunately the shortage of staff has prevented any concentrated attack upon the many grassland problems awaiting investigation.

EXPERIMENTAL FARMS AND FARM CENTRES

13. Field experimentation and agronomic investigations were continued at nineteen experimental farms and farm centres, and, in addition, special investigations, suggested by the Groundnut and Rice Missions, were started at some of these farms and on other land. Soil fertility investigations included experiments with organic and inorganic fertilizers, and with fallows, natural and established ; agronomic experiments, of both local and general application, included trials of new crops and varieties, together with cultivation, time of planting, and spacing investigations. No attempt will be made to discuss experimental results in detail in this report, but it is hoped to publish a special bulletin on the subject when time and the staff situation permit. Although useful progress has been made, there is still a very great deal to be done and learned, particularly on the vital problems connected with soil fertility and land utilisation. A series of long term fallow and manurial experiments, laid down at Yandev in Benue Province, are beginning to provide valuable preliminary information. The indications are that comparatively high applications of farm yard manure are required to maintain fertility over a long period on these indifferent soils, and that, although Gamba (*Andropogon guyensis*) is promising as an established fallow, a fallow period, in excess of two and a half years, is required for the maintenance of fertility.

Chemistry, botanical and entomological investigations are reported on separately in the part of this report which deals with the work of the Specialist Sections of the Department.

The maintenance of cattle pools for the provision of stock to mixed farmers was also one of the main activities at farm centres.

COMPOST

14. Propaganda for the conservation and use on the land of all forms of household refuse and crop residues was continued everywhere and special attention was given to this important line of work in the many areas where the farming community is not yet manure conscious.

Demonstrations of methods of producing compost and its effect on crop yields were carried out but, although increasing interest is being shown in some areas, it is evident that continuous propaganda and demonstrations over a long period will be required to achieve substantial progress. Spectacular increases in crop yields by the use of compost were obtained on demonstration plots, as is shown by the following figures, recorded in the Tiv Division of Benue Province, from farms planted with millet followed by guinea corn.

Millet

Average yield per acre from thirty-eight plots dressed with 5 tons compost per acre, 604 lb grain.

Average yield per acre from thirty-eight plots with no compost, 367 lb grain.

Guinea Corn

Average yield per acre from twenty-seven plots dressed with 5 tons compost per acre, 445 lb grain.

Average yield per acre from twenty-seven plots without compost, 270 lb grain.

SOIL CONSERVATION

15. Good progress was made with soil conservation work on departmental farms and the effects, both on control of erosion and conservation of water, are becoming increasingly apparent. Fifty-two miles of terraces were completed at Shika, Samaru, Maigana and Yola Farms and costs varied from 1.7d to 8d per yard.

A successful demonstration of soil conservation is in progress at Damberta in Kano Province. This scheme involves the protection of poor grazing land and its further improvement by rotational cultivation. About 500 acres have already been protected by some 8,000 yards of terraces, and water, which previously passed through the town and market to enter a rapidly developing gully, was thus controlled. The local people are enthusiastic about the benefits of the work so far and are keen that it should continue.

No extensions were made during the year to the protected area at Gyel in Plateau Province, as it was decided that land, where the effects of erosion was less advanced, should have priority in experimental and demonstration work. The system at Gyel stood up well to the rains, however, without any breaks. Gullies are silting up, water logging is less evident, and the grass cover has greatly improved, the latter being partly due to the exclusion of cattle from the area. Some local farmers will now grudgingly admit that the land has improved, but local feeling is still against this work, mainly on the grounds that too much land is put out of cultivation by the terraces themselves. After considerable difficulty, the people of Vom Turu were eventually persuaded to make available an area of 264 acres of land, where erosion was still in the early stages, for trials and demonstrations of different anti-erosion measures, including simpler and cheaper systems, which, if effective, might prove more acceptable to local

farmers. The experimental area was laid out to compare the efficacy of systems, including standard terraces, double channel terraces, small benches and grass strips Among other difficulties the work was complicated by the need to conform to various religious customs, but it was nearing completion by the end of the year.

In other provinces, work on soil conservation consisted of propaganda to persuade the farming community to adopt simple anti-erosion measures, which were demonstrated on a small scale, and the collection and recording of information on eroded areas. Little progress can yet be recorded, however, on the achievements of propaganda in this direction, though it is reported from a few areas that farmers are becoming a little more interested.

IRRIGATION

16. In September, an Irrigation Engineer with wide experience in Pakistan was seconded by the Public Works Department, and he was posted to Niger Province to replace the Executive Engineer previously lent to the Department. In the earlier part of the year the collection of data for the Rice Mission in areas considered potentially suitable for irrigation schemes, occupied a good deal of time. Good progress was, however, made in survey work and in the collection of engineering data required for the preparation of plans and estimates for an irrigation project in the Wuya-Edozhigi area of Niger Province. The necessary map of the area was completed and the collection of further data required proceeded as fast as possible with the aim of starting construction in 1949. As development is dependent on adequate trained Junior Service staff the Irrigation Engineer spent a good deal of time in training locally recruited staff in survey, levelling, and river discharge work. Arrangements were made for extending training facilities in 1949, and for this purpose the Public Works Department is providing the services of an Engineering Assistant.

Attention was also given by the Irrigation Engineer to the possibilities of improving existing native irrigation works by the construction of weirs and spillways in place of earth dams which get easily washed away. Minor irrigation projects were maintained and extended in Bida, Agaie, Lapai and Abuja Emirates in Niger Province, and irrigation work outside Niger Province was confined to encouraging and demonstrating small and simple projects of this nature, using earth dams, leats, or water lifts.

MECHANISATION

17. While the slow delivery of tractors and implements limited work on mechanisation problems during the year, plans were prepared for a comprehensive programme of investigations, and preliminary work on these was started. Arrangements were made to open experimental tractor farms at eight centres, *viz.*, Badeggi, Bauchi, Daudawa, Ilorin, Kafinsoli, Maru (Sokoto), Maiduguri and Shika. By the end of the year sites had been selected at all except Maiduguri, and preliminary clearing operations were in progress at four of the sites. Each farm will be operated as a single tractor unit, and will later be laid out in family holdings of a suitable size, eventually to be occupied by settlers, if experience shows that mechanisation can be successful economically and otherwise. Sites have been chosen with a view to development and extension on those or similar lines. In the first year it is intended to cultivate about 100 acres at each centre. For the maintenance of soil fertility, fallows will be included in the rotation and, where Trypanosomiasis permits, the farms will be stocked with cattle. A special order was placed for fifteen tractors of four different makes, together with a range of implements, for use on these farms, and efforts were made to speed up delivery.

Four Ferguson tractors, equipped with implements, were delivered to the Department in 1948, and a representative of the makers visited Nigeria to give demonstrations at Samaru and Kano. These tractors were used on departmental farms, but they arrived too late to enable more than preliminary trials to be carried out. At Sokoto, an old Farmall tractor and Motrac plough were used to cultivate fadama land for farmers in preparation for rice. This tractor, which was used as a stop gap, pending the arrival of one specially ordered, was not very suitable for the job, but despite breakdowns and other mechanical difficulties, 150 acres were ploughed. Farmers, although initially suspicious, later displayed much enthusiasm, and it is evident that there are good prospects for development of mechanisation on rice land of this nature, if it is found possible to operate suitable tractors and implements on an economic basis.

Workshop buildings at Samaru, required for the maintenance and repair of agricultural machinery, were completed and training of tractor operators and repair and maintenance staff was continued and expanded. To cope with the mechanisation programme envisaged, arrangements were made for the establishment of an Agricultural Engineering Branch of the Department with suitably qualified Senior Service staff, and for the provision of additional servicing and repair facilities.

MINES RECLAMATION—PLATEAU PROVINCE

18. Despite monetary compensation, the farming community in Plateau Province is becoming increasingly concerned about the destruction of farm land by tin mining operations, and it will be necessary to attempt restoration wherever possible even at a cost which could not normally be regarded as economic. Although the annual percentage of farm land so destroyed is comparatively small, and its reclamation can at best be but a temporary palliative to soil degradation and land hunger in that area, the main causes of which are over cultivation and erosion, the indigenous farmers naturally do not yet see the problem in that light.

Much time was spent by the Agricultural Officer, assisted by a Development Officer, in experimental work planned with the advice of the Agricultural Chemist, to investigate methods and economics of restoring to agricultural use, abandoned tin workings of various types. Trials are in progress on soil regeneration by the establishment of a variety of vegetative covers, including natural regeneration, with the aid of compost, artificial fertilizers and top soil, separately and in combination. It is yet too early to draw any conclusions, but the indications are that, with dressings per acre of the order of 25 tons compost, plus 100 lb each of Sulphate of Ammonia and Superphosphate, costing in all about £9, satisfactory vegetative covers can be established. The length of fallow period necessary to render the land fit for regular cultivation has yet to be ascertained. Inorganic fertilizers alone have been shown to be of little value on such soil, and the addition of top soil had no apparent effect; the cost of transporting top soil by hand labour is in any case, prohibitive. Experiments were also carried out to discover if economic crop yields could be obtained on water deposited tailings in an area which had been regenerating naturally for some years. With no manure or moderate dressings of compost and artificial fertilizers the Dauro (variety of Millet) crop failed or nearly failed and, although dressings per acre of 25 tons compost plus 3 cwts each of Sulphate of Ammonia, Superphosphate and Muriate of Potash, produced a high yield of 1,021 lb grain per acre, the manures alone cost £19 per acre, thus making it completely uneconomic. These results show that immediate exploitation of such land would necessitate very heavy annual dressings of manure and is therefore out of the question economically.

On the mechanical side, the levelling of existing dragline and shovel dumps and the filling of the deep excavations resulting from this type of mining operations, are not practicable propositions and the cost would be prohibitive. The best that can be hoped for here is to minimise their formation in the future. The Agricultural Officer, as a member of the Resident's Advisory Committee, spent a good deal of time on investigations connected with the drafting of conditions for mining leases, with the object of ensuring that the minimum amount of irreparable damage is done to the land. Funds for mines' reclamation were provided in Departmental Estimates, and heavy mechanical earth moving and levelling equipment is on order.

LAND SETTLEMENT AND PLANNED FARMING

19. Farmers in Daudawa and Maska settlements had another good farming year and, as a result of judicious weeding out of unsatisfactory farmers, the general standard of husbandry is good, and continues to improve. Increasing prosperity, however, tends to encourage too fast a rise in the standard of living, and this, together with the impecunious nature of many of the settlers, has led to difficulties in obtaining repayment of debts. Experience at Daudawa has indicated that settlement of sparsely populated or unoccupied land is likely to be a much easier proposition than the grafting of an advanced system of agriculture on a group of existing farmers in areas where redistribution of land holdings is necessary. At Maska, where the scheme involved redistribution of land holdings, a high proportion of poor farmers have had to be replaced.

The Agricultural Officer, Plateau Province, assisted in a scheme with the object of planned settlement of a large uninhabited area of Shendam Division by people from congested areas, and good progress has been made. After preliminary reconnaissance, a site for a pilot settlement was selected near Inshar, and fifty ex-soldiers, natives of the division, were brought in. They erected their own temporary houses, and carried out clearing operations and farming by communal effort, preparatory to the allocation of individual holdings for next year. These men settled down well, and worked with enthusiasm. The scheme has excited great local interest and, in the latter part of the year, a second site was selected and seventy families of the land hungry Hill Yergam tribe of the division were starting to move in at the end of the year. Assistance and advice were also provided on the agricultural side of two other Native Administration projects, *viz.*, a Model Hamlet near Kontagora, and a similar scheme at Mbakon in the Tiv Division of Benue Province. At the former, where it is proposed to settle some twenty families in an area which includes a fertile fadama, preparatory clearing of about 600 acres has been done by the end of the year. The Mbakon scheme involves redistribution of existing land holdings, and proposals are based on mechanised cultivation and the use of cattle and established fallows for the maintenance of soil fertility. A preliminary survey was carried out, a tractor and implements were ordered, and a start was made in erecting cattle pens.

AGRICULTURAL TRAINING CENTRES

(*a*) Ex-servicemen's Training Centre, Kafinsoli

20. Thirty-nine ex-servicemen from seven of the Northern Provinces attended the centre during 1948, and completed a course of training in mixed farming. Great emphasis was attached to the making of manure and compost, and it is estimated that four tons of farm yard manure per beast was made. The trainees have returned to their own homes, where they will be assisted by their respective Native Administrations and by the Nigerian Ex-servicemen's Welfare Association. The centre is being enlarged to take seventy trainees in 1949.

(*b*) Katsina Native Administration Farm Training Centre, Kafinsoli

Thirty-three pupils, mostly ex-elementary schoolboys, completed their course of training in mixed farming, and returned to their homes to take up farming on their own, or with their parents.

(*c*) Jos Native Administration Farm Training Centre, Riyom

Nine Birom ex-schoolboys and an ex-serviceman from Wana completed the second course in 1948 and have returned home to set up as farmers on their own. The first eleven students trained at the centre have settled down to mixed farming, and all have done well for their first farming year. Houses and cattle pens were provided. Six settled in their own villages, and the others formed a hamlet of their own near Ganawuri. Their keenness is very gratifying and all are looking after their cattle well.

GROUNDNUTS

21. The following are comparative tonnages on a provincial basis, showing purchases up to the 14th April for the 1947-48 and 1948-49 seasons.

	1947-48	1948-49
Kano	189,796	175,694
Katsina	39,444	45,284
Sokoto	28,940	43,147
Bornu	39,699	28,570
Bauchi	13,842	14,984
Adamawa	10,557	9,067
Other Provinces..	5,984	8,351
	328,262	325,097

Note.—Total figure for the 1947-48 season was 329,609 tons.

The announcement of an advance in price for the 1948-49 crop stimulated an increase in acreage planted, especially in Katsina and Sokoto Provinces. In Kano Province, the drought in May destroyed the volunteer crop germinated by the early rains, and, while the main crop did very well, the late crop suffered from light rains in the latter part of September which also adversely affected threshing percentage. Yields were below average in Bornu and Adamawa, but in Sokoto and Katsina the season was favourable and yields were good. As a result both of a good growing season and increase in acreage, Sokoto has taken third place in the list of producing provinces with a substantial increase in purchases for export.

Propaganda to encourage closer spacing of seed was continued in Kano Province and demonstration plots were again laid down in twenty-five districts. Average yields of shelled nuts for the past six years are as follows :—

Southern Belt ..	1943	1944	1945	1946	1947	1948	Average 6 years
Close Spacing ..	617	726	599	690	661	619	651
Local Spacing ..	473	592	483	507	511	464	565
Middle Belt ..	1943	1944	1945	1946	1947	1948	Average 6 years
Close Spacing ..	544	543	735	710	548	599	613
Local Spacing ..	502	536	585	435	467	483	501
Northern Belt ..	1943	1944	1945	1946	1947	1948	Average 6 years
Close Spacing ..	488	465	696	511	641	623	571
Local Spacing ..	386	344	553	437	566	527	469

Although these demonstrations have provided convincing proof that, with the closer spacing recommended, substantial increase in yield can be obtained, the response from farmers has been slow. The effect on local practice was first noticed in 1947 and further progress, though still gradual, was made in 1948.

ALLEN COTTON

22. Last season the Allen Cotton export trade experienced very heavy competition from the local spinning and weaving industry which, in recent years, has been greatly stimulated by the shortage of imported textiles. Only some 18,445 bales of 400 lb lint were purchased for export from the 1947-48 crop. There are indications that cotton purchases for local use were considerably overbought last season, with the result that competition for the crop in the 1948-49 season was much less severe. The early announcement of a substantial increase in the price to be paid for the 1948-49 crop led to an increased acreage (estimated at around 15 per cent) of Allen Cotton in the main cotton belt. Distribution of cotton seed for the season's planting totalled 6,468 tons compared with 5,655 tons for the previous years. The comparative figures for the three main cotton provinces are as under :—

	Seed Distribution		
	1947 *Tons*	1948 *Tons*	*Increase per cent*
Katsina Province	1,947	2,442	25
Sokoto Province..	1,536	1,727	12
Zaria Province	1,095	1,164	6

The season was very favourable for the July plantings, and, with the exception of Southern Katsina, the weather was ideal up to the end of September, at which time there was hope that the season's yield might reach 1940-41's record total. The abrupt cessation of rain, and the early October onset of harmattan, however, caused a high rate of boll shedding, and yields, especially of late sown cotton, were adversely affected. In addition, heavy August and September rainfall in Southern Katsina caused much waterlogging and damage to the crop. The increased acreage, however, largely offset the lower yields and purchase of seed cotton up to the end of March, 1949, totalled 25,316 tons, compared with only 9,862 tons in 1947-48. A total of over 46,000 bales of lint is a great improvement over last season, and it is the best figure achieved since the 1940-41 record of 65,963 bales.

The decision to pay a flat rate price at all gazetted markets of 4d per lb for Grade I seed cotton represented a substantial increase in price over the range of from 2.4d to 3d per lb according to last year's transport differential. Grade II flat rate of 3.9d per lb in 1948-49 compares with from 2.1d to 2.5d per lb during the 1947-48 season.

The multiplication of Strain 26C cotton for general distribution has been speeded up, and it is expected that 125 tons of this seed will replace commercial Allen at the Faskari dump in 1949. Strain 26C's value lies in the higher lint percentage obtained in comparison with the commercial strain now grown. The following ginning percentages were obtained from the various stages in the multiplication of seed supplies, and are compared with those obtained from the commercial crop at Zaria and Funtua ginneries.

Column III gives the value of lint per lb based upon Manchester Broker reports on bale samples :—

I *Seed Cotton Type*	*II* *Ginning percentage*	*III* *per lb valuation Lint*
Funtua Commercial	33.2	23.85d
Zaria Commercial	34.62	23.54d
Stage 1 multiplication of 26C Strain ..	36.50	23.65d
Stage 2 multiplication of 26C Strain ..	37.14	23.70d
Stage 3 multiplication of 26C Strain ..	37.90	23.60d
Stage 4 multiplication of 26C Strain ..	35.02	23.70d

The Empire Cotton Growing Corporation provided an Entomologist specifically for work on cotton pests, and reference is made to the preliminary results of his investigations in the Entomological Section of this report.

BENNISEED

23. The increase in the price of Benniseed for export in 1947 stimulated planting in Benue Province, where the bulk of the crop is produced, and the total purchases for the calendar year rose to 15,642 tons, compared with 8,605 tons in 1947. Weather conditions were favourable for the main crop, but the early cessation of the rains affected the dry-season crop from which yields were poor. There was a somewhat better response from farmers to propaganda on the weeding and thinning of the crop.

VIRGINIAN TOBACCO

24. The following are the comparative figures for the Virginian Tobacco Crop in Zaria Province, sponsored and purchased by the British American Tobacco Company for their Ibadan cigarette factory.

Year	*Zaria Province purchases cured leaf lb*	*Approximate acreage*	*Approximate yield cured leaf per acre*
1944-45	57,857	200	289 lb
1945-46	149,047	559	267 lb
1946-47	167,652	806	208 lb
1947-48	82,272	290	284 lb

Propaganda to extend tobacco growing in the Southern Districts of Sokoto Province, was carried out by the British American Tobacco Company, and some 2,000 lb of cured leaf were purchased in the 1947-48 season. An increase in price to 1s per lb Grade I leaf has been announced for the 1948-49 season's crop and, as a result, the acreage planted has risen in Zaria Province to approximately 700 acres.

GINGER

25. In the ginger growing area of Southern Zaria, work on the crop was largely confined to the organisation of a single market at Katchia for the export surplus; the ginger trade is now sufficiently well established no longer to need special propaganda on cultivation and curing. The prices paid for cured ginger for export were 5½d per lb for Grade I and 4½d per lb for Grade II. Total purchases amounted to 82½ tons, of which 83 per cent was Grade I and 17 per cent Grade II, compared with a total of 104 tons last year. Quality was better than in previous seasons due to the exceptionally favourable weather conditions prevailing during curing, and there were no cases of analysis of samples falling below B.P. standards.

SUNFLOWER

26. Small scale trials of sunflower, carried out at several agricultural stations in recent years, showed that this crop can do well, and yields of up to 1,000 lb seed per acre have been recorded on favourable soils. As the result of enquiries from the United Kingdom, small quantities of seed were distributed to farmers in selected areas in Katsina, Sokoto, Zaria, Plateau, Niger and Benue Provinces, in order to test the possibilities of developing the production of this oilseed for export. Promising results were obtained in all areas except in Benue Province and in the Daura Emirate of Katsina, where yields were very poor, and the crop, which is easy to cultivate, proved popular with farmers. The indications are that, at prices ruling this season, it could become a serious rival to cotton and, possibly also to groundnuts in certain areas. The crop did particularly well in Southern Katsina and in parts of Niger Province. Up to the end of January, 1949, some 70 tons of seed had been purchased for export.

SOYA BEANS

27. Satisfactory yields of seed have been obtained in trials of different varieties of soya beans at agricultural stations in recent years, and the value of the crop for ensiling, and as a leguminous dry season fodder for stock, has been proved. But, although this bean should offer a nutritious addition to the diet of the people, it has not yet found favour anywhere for this purpose, mainly owing to cooking difficulties. Efforts to encourage the production as an export crop were continued in Benue Province, Southern Katsina, and Southern Zaria, but, only in the Tiv Division of Benue, has it yet become popular; production for export in that area rose to about 700 tons compared with $10\frac{1}{2}$ tons and 77 tons in 1946 and 1947 respectively. Unfortunately, however, there is evidence that this large increase in production was achieved at the expense of food crops, so that it is undesirable to encourage it too far among the Tivs. Production for export in Southern Zaria rose from $1\frac{1}{2}$ tons in 1947 to 9 tons in 1948.

RICE

28. Although the bulk of the rice produced in the Northern Provinces still comes from the rice growing areas of Sokoto, Niger and Ilorin Provinces, increasing interest in the crop is being shown in many other areas, notably in Northern Kano, Southern Zaria and parts of Benue Province. The area cultivated continues to expand and every encouragement is given to this trend by propaganda, advice on cultural methods, and by distribution of supplies of seed, grown on special multiplication farms or purchased from native farms selected for purity. Some 15 tons of seed, of the variety Guiana 79, were purchased from selected native farms in Zaria and Ilorin Provinces, and the Zaria seed was distributed to Sokoto, Kano, Katsina and Plateau Provinces. In purchasing seed, an attempt was made to insist on 98 per cent purity, but this was found to be unattainable and the standard had to be reduced to 95 per cent, which is too low. For this reason, next year it will be necessary to produce a higher proportion of requirements of pure seed on departmental farms or on multiplication farms, cultivated specially for the purpose. In Sokoto Province yields were below average as a result both of the excessive flooding and the early cessation of the rains, but the crop did well in most areas of Niger and Ilorin Provinces where the season was favourable. Prices continued at a high level with an upward trend. In Eastern Sokoto, for instance, it is estimated that the price for rice over the season averaged about £40 per ton.

Rough surveys of rice growing areas were made in Southern Zaria and in the Lafiagi-Pateggi districts of Ilorin. These indicated that some 2,000 acres of rice were cultivated in the former area and 5,600 acres in the latter. Rice variety trials were

continued at Kware, Birnin Kebbi and Argungu in Sokoto Province, but deep flooding in September at Kware, and rodent damage at the other sites, resulted in low and unreliable yields. Insufficient flooding caused low yields in a number of small trial plots near Maiduguri, established on the recommendation of the Rice Mission.

The rice mills at Badeggi and Baro, in which native hand-prepared rice is cleaned and polished, continued to be operated by the Department. With the lifting of control of movement of rice in Niger Province, increased prices had to be paid for unmilled rice. 438 tons of rice were milled during the year and, although this total was well below the capacity of the two mills, it was sufficient to supply all orders.

SUGAR

29. The brown sugar industry continued to expand, the saturation point of demand for the product appears to be as remote as ever. During the year 152 imported crushers were readily sold and when these are all set up it is estimated that a total of approximately 430 will be in operation. Further orders were placed for some 300 crushers of which more than half are expected to arrive early in 1949, and there are good prospects for adequate future supplies. Crushers were allocated to seven provinces, but Zaria remains the most important extraction centre. Precise figures are not available, but it is estimated that Zaria Province production of brown sugar was in the region of 3,000 tons during the year which, at a retail price of £56 per ton, represents a total value of £168,000. Railings from Zaria Province for the last three seasons are as follows :—

1945-46	627 tons
1946-47	884 tons
1947-48	1,972 tons

Of a total of approximately 5,000 acres of sugar cane grown in the Makarfi District of Zaria, it is estimated that the cane of 1,350 acres is utilised in the brown sugar industry, while the balance is absorbed by the chewing trade. Railings from Gimi Station of cane and brown sugar, which are given below, support the report that the demand for chewing cane keeps pace with the increased consumption of brown sugar, and that the acreage under sugar cane is steadily increasing.

	Railings from Gimi Station	
	Sugar Cane (tons)	*Brown Sugar (tons)*
1946	1,356	523
1947	2,036	608
1948	2,507	1,162

FRUIT

30. At several of the regional stations the maintenance of nurseries, and the distribution of fruit trees continue as an important sideline of agricultural activity, and during the year some fifteen thousand seedlings and budded trees were distributed. Of this total nearly 5,000 were budded citrus, and over 2,000 budded mangoes. The most important citrus nursery is at Yandev, Benue Province, which, besides meeting all local demands, supplies about half of the demand from the Northern Provinces. Budded citrus were also distributed from Bornu, Ilorin, Kabba and Zaria nurseries. The citrus root stock trial at Ilorin confirms the superiority of sour and sweet orange under northern conditions.

Rootstock	*Annual average yield of fruit per tree two years* 1947-49	*Weight/100 fruits*
		lb
Sour Orange	396	64
Sweet Orange ..	319	53
Acid lime	151	69
Shaddock	130	63
Grapefruit ..	121	53
Rough Lemon ..	120	79

Some 260 oil palms, 400 coffee, and 1,000 cocoa seedlings were distributed from Kabba, whilst other types of fruit distributed in the region were banana suckers, and seedlings of guava, pomegranate, pitango cherry, cashew and pawpaw.

Dates.—The twelve acre Date plantation at Fika in Bornu Province continued to make good growth. It is now definitely established that the production of offshoots for clonal reproduction, is only possible if the young palm receives an adequate water supply but, on the other hand, water-logged conditions are not tolerated. There may be differences between varieties in respect of water requirements. Multiplication of female palms is in progress, and males are being culled.

An acre plantation of date palms was successfully established at Yola with seed from selected trees at Maiduguri.

VEGETABLES

31. Organised during the war to meet army needs, marketing gardening of European vegetables suffered a marked decline in the post-war period. The industry, however, survives near many of the larger towns and African demand for such vegetables has expanded and has stimulated production in some areas. Kano gardeners continue to supply part of the Lagos market and 225 tons were railed in 1948.

Onions.—Onion growing continues to be a flourishing trade in several provinces, especially in Kano, Sokoto and Zaria, where prices were high during the year. The demand for seed is invariably in excess of supply, and efforts were continued to stimulate production. Seed production is highly specialised ; selected dry season bulbs have to be carefully dried and stored for six or seven months. Towards the end of the rains, the bulbs are ringed near the apex, and are then left to form bulbets, which are grown for seed in dry season irrigated gardens. Zaria onion growers specialise in a wet season crop, which is marketed between October and December before the irrigated crop is available from other provinces. Considerable tonnages are railed to Southern markets, especially from Kano and Gusau. Railments from the latter centre totalled 244 tons in 1948.

POTATOES

32. The growing of potatoes continues as a specialised industry in Plateau and Zaria Provinces, and appears to be recovering from post-war fluctuations and from renewed overseas competition. Wilt disease was less prevalent on the Plateau than in 1947, and the Zaria crop was relatively free from disease. Prices fluctuated between £14 per ton during the autumn glut and £56 per ton for the dry season crop. The following summarises railments of graded potatoes from the two provinces for the three years 1946 to 1948.

	1946	1947	1948
	tons	tons	tons
Plateau	671	396	516
Zaria	244	133	187
Total ..	915	529	703

No fresh seed was imported during the year.

KASHIN YAWO—ACANTHOSPERMUM HISPIDUM

33. The very promising results, previously obtained with D.N.O.C., in experiments in the control of Kashin Yawo were nullified when we received information that this substance was liable to be lethal to the operators. Methoxone spray and dust, continued to give good results, and another new substance, Chloroxone, which became available during the year, proved very promising. It becomes increasingly evident that control of this weed will necessitate a combination of mechanical spraying on open spaces, and rigidly enforced communal effort on farm land, and that the cost of effective control both in money and effort will be formidable. The stage has been reached where the technique and economics should be worked out in a large scale trial of mechanical spraying. To this end we have kept in close touch with experts in the United Kingdom and the advice and assistance of Long Ashton Research Station, Bristol, has been obtained in efforts to get suitable apparatus designed and supplied.

LOCUSTS

34. No locusts swarms were reported during the year. Six mounted locust scouts continue to patrol the breeding areas of Lake Chad, and three scouts are similarly employed in Adamawa.

J. W. Wallace,
Deputy Director of Agriculture,
Northern Provinces

II. Annual Report: Western Provinces and Colony, 1948

INTRODUCTION

The shortage of Agricultural Officers to which reference was made in the 1947 Annual Report became even more acute in 1948. It became abundantly obvious that some reduction of our services was inevitable. It was accordingly with considerable regret that in August, 1948, it became necessary to curtail our activities in Benin and Warri Provinces by closing temporarily the Provincial Office at Benin. Important lines of work have, however, been maintained with the assistance of the Provincial Administration staff for which the Department is deeply grateful. In addition, the Agricultural Officer, Ondo Province, has been able to make periodic visits to give a limited amount of supervision and advice. It is emphasised that this course is only temporary and will be remedied as soon as the senior staff situation permits the normal services of the Department to be restored. In spite of the serious shortage of staff it is encouraging to record that many of the lines of work initiated by the Department continue to expand on their own momentum which is a gratifying tribute to the sound principles on which our extension work policy has been based.

THE 1948 SEASON

2. Rainfall in the Western Provinces was above average in Benin and Warri Provinces but was considerably below normal on the Western side especially in Ibadan Division of Oyo Province and in Abeokuta Province and the Colony. The following table gives the rainfall for representative stations in the Western Provinces :—

	Agege	*Abeokuta*	*Moor Plantation*	*Oyo*	*Akure*	*Benin*	*Warri*
	ins.	*ins.*	*ins.*	*ins.*	*ins.*	*ins.*	*ins.*
January	—	0.11	—	—	—	0.19	3.96
February	1.30	2.15	0.81	0.18	1.25	1.20	1.82
March	1.23	4.24	3.04	4.45	4.31	3.83	3.78
April	2.55	8.00	8.01	7.52	8.37	6.79	10.96
May	13.76	3.81	2.85	5.69	8.37	8.20	10.79
June	9.88	4.31	3.24	6.65	6.18	12.91	17.30
July	0.95	3.72	1.71	2.23	3.14	22.65	31.47
August..	0.72	0.77	0.62	2.19	1.74	7.43	13.82
September	2.17	1.86	5.06	5.74	6.15	14.76	24.58
October	4.73	3.56	4.41	4.76	5.26	8.02	12.93
November	1.56	1.48	1.36	1.55	2.92	2.85	2.54
December	—	0.08	—	—	—	—	—
Total	38.85	34.09	31.11	40.96	47.69	88.83	133.95
Average for past years ..	53.22 21 years	46.27 10 years	48.94 39 years	43.86 12 years	57.12 17 years	87.43 26 years	101.79 8 years

In general, the year was favourable for most crops as the rainfall in the drier areas was comparatively well distributed, though the long period of dry weather which extended from July to September had an adverse effect on the yield of guineacorn and to a lesser extent on upland rice in Abeokuta Province. On the other hand, this mid season drought was favourable to the cocoa crop in reducing very considerably the incidence of black pod disease which was negligible in comparison with 1947.

ANIMAL HUSBANDRY

Cattle

3. (*i*) *N'dama Breed.*—The N'dama multiplication scheme at Oyo experienced a successful year. Increases are shown in the following table :—

Type of Stock	*No. at* 29.1.48	*Increase during year*	*Decrease during year*	*No. at* 29.1.49
Original Import :				
Bulls	16	2	5	13*
Cows	70	—	—	70
Born on the Farm :				
Bulls	7	30	—	37
Heifers	6	38	1	43
Total	99	70	6	163

* Five bulls were issued to other stations and two were received from Ilorin.

The average weight of bull calves at birth has been 43 lb and for heifer calves 38 lb with subsequent live weight increases of 1.5 lb and 1.4 lb per day respectively, an increase of 0.2 lb in each case over 1947. The single loss was due to scour. Nine cows have calved twice ; the average period between calves born to dams whose breeding was not interrupted by segregation for contagious abortion control was 410 days.

Trypanosomiasis.—There were no confirmed cases of trypanosomiasis during the year. A party from the Tsetse Research Institute caught 173 specimens of Glossina palpalis, none of which were found to be carrying trypanosomiasis. The two bulls from Ilorin have, however, shown trypanosomiasis in their blood on several occasions, so it is possible that they still carry the infection.

Contagious Abortion.—The contagious abortion outbreak described in the previous report was controlled in collaboration with the Veterinary Department through the policy of segregation based on reactions to the agglutination test. It is probable that contagious abortion has now been eliminated from the herd as a year has passed since any animal has reacted positively to the agglutination test. Thirty-one young stock have been tested and have given negative reactions. Twenty-four young stock were vaccinated with Strain 19 in September, 1948 ; of the twelve since tested, however, all gave a negative reaction to the agglutination test. There have been altogether six losses of calves from abortions, two of which were not considered to be contagious. The percentage of contagious abortions to live births has fallen to 5 per cent.

Routine inoculations were given as required ; twelve animals received double (serum and virus) inoculations against rinderpest and gave a satisfactory reaction without loss.

(*ii*) *Sanga* (*Kaiama*) *herd.*—At the Oyo Farm School the foundation herd of Sanga cattle which is being graded to N'dama bulls continued in good health, except for a short outbreak of foot and mouth disease which caused the death of one half bred calf. The average weight at birth is 41 lb and the time taken to reach 200 lb is thirty-two weeks. The N'dama conformation shows up strongly in the first generation though only about fifty per cent exhibit typical N'dama colouring. A second generation is now being produced but in comparison with the first generation half breds, the three quarter

N'dama progeny do not appear to be so vigorous. The average birth weight appears to be slightly lower being 34 lb and the average time taken to reach 200 lb is thirty-six weeks. No concentrates are fed except for a short period in the dry season. Calf mortality during the year has remained very low only two calves were lost one from anaemia and the other from a bolus. An analysis of the Sanga herd at the close of the year is given in the following table.

Breed	*Bulls*	*Cow*	*Bull Calves*	*Heifer Calves*	Total
N'dama	2	—	—	—	2
Sanga	8 (work)	16	1	2	27
Half N'dama	12	24	13	9	58
Three quarter N'dama	2	—	7	6	15
	—	—	—	—	102

(*iii*) *Short horn* (*Muturu*) *Herd.*—On Moor Plantation, the grading up of Nigerian and Gold Coast Shorthorn cattle to N'dama bulls with the object of producing animals of better conformation for work and meat has continued throughout the year. Second generation calves are now being produced and in comparison with the foundation stock and first generation half bred progeny, the three quarter bred N'dama calves show an improvement in birth weight and in their rate of growth.

Dairies

4. (*i*) *Agege Dairy.*—At the end of March, Lagos Dairy was closed down and the stock and equipment transferred to the site of the former Cattle Fattening Scheme at Agege, comprising an area of approximately 250 acres already Government property. This move entailed considerable reconstruction of the old buildings which, having been designed for stall feeding of fattening cattle, were not well adapted to clean milk production. The extra land available at Agege has considerably facilitated the provision of regular supplies of grass and roots which had been costly and difficult to obtain at the old site. In addition, it has been possible to set aside grass land for use as pastures and permitted trials to be made on the effect of grazing on health and breeding performance of Zebu cattle in the Southern Provinces. In the old Lagos Dairy premises the breeding performance of cows had been so unsatisfactory on account of the necessity for keeping the cows under too close confinement owing to lack of space, that it was found necessary to return cows to the Northern Provinces to get them in calf again. Similarly the rearing of heifers for herd replacement had to be undertaken in the North, entailing much extra trouble and expense. Regular grazing on the new site at Agege for periods ranging between 4½ and 12 hours has led to steady improvement in breeding performance and calf rearing and has permitted the closing down of the Northern Provinces organisation. So far no serious difficulty from trypanosomiasis has resulted. Tsetse fly counts made on the farm indicate that the risk as yet is not very great, but as an additional precaution grazing is limited to the central fields only so that cattle are never within 150 yards of the nearest bush.

Contagious abortion troubles, which proved so disastrous at Lagos in 1946 and 1947, have been largely overcome by culling positive reactors and inoculation of all stock with Strain 19. There has been a marked improvement in milk production per cow which rose from an average of 0.57 gallons per head per day in January to

0.80 gallons in December. As a result of this factor and the steady increase in numbers of milking cows, total milk production rose from 10 gallons per day in January to nearly 32 gallons per day in December. A revenue of £1,868 was realised from sales of milk compared with £923 during 1947.

(*ii*) *Moor Plantation Dairy.*—The herd was increased towards the end of the year to a total of eighteen cows with the object of putting the dairy which had hitherto been an experimental unit on to a more economic footing. A contract has been entered into with a milk retailer in Ibadan and fresh milk is now being sold daily in Ibadan town.

Cattle Control

5. In Ondo Province the number of controlled herds increased from forty-one to fifty-one. In Benin Province there were no additions to the kraals, which remain at twelve. Four herds in the Akoko federation of Ondo Province were nearly decimated by rinderpest. In one herd only a N'dama bull and two other beasts survived out of about forty head of cattle. The projected expansion of Veterinary Services in the Western Provinces, will, it is hoped, enable outbreaks of this nature to be effectively controlled.

POULTRY

6. An Agricultural Development Officer has remained in charge of the Oyo Poultry Farm throughout the year and several junior staff have been given special training in poultry work with the object of posting them to sub-stations as soon as stock is available for distribution.

The experiment of importing new blood in the form of day-old chicks and hatching eggs by air to which reference was made in the Annual Report for 1947 has proved eminently successful. Losses of chicks in transit were negligible amounting to less than 1 per cent, and 83 per cent of the chicks were successfully reared to maturity.

The results obtained from the hatching eggs proved less successful only in respect of the hatching percentage which was 54 per cent, the subsequent rearing results were equal to those obtained with the day-old chicks. These birds were raised to maturity and began laying in twenty-four weeks which reflects the great care and efficiency exercised by the officer in charge.

By the end of 1948, all the original stock at the Poultry Farm had been replaced by this new foundation stock imported from the United Kingdom. In addition, it was possible to make the first issues to other departmental farms. A beginning has therefore been made towards the improvement of other Rhode Island Red Poultry kept by the Department. Breeding is proceeding at a satisfactory rate at Oyo and a mammoth incubator capable of taking three hundred and fifty hatching eggs weekly has recently been installed and is expected to be in full operation by April, 1949, when the main hatching season is due to begin.

Some considerable inconvenience has been experienced through the slow delivery of Crown Agents indents resulting from shortages in supply in the United Kingdom ; nevertheless houses have been constructed and equipped to accommodate two hundred adult stock and fourteen hundred growing stock of various ages.

The introduction and multiplication of Rhode Island Poultry has not been the only line of development. Small breeding pens of Emden Geese and Pekin Ducks have been established with birds obtained from South Africa. A Nigerian type of duck somewhat resembling the Mallard was bought from a village in Badagry Creek. Though the numbers are small, breeding has been successful and ducks appear to thrive during the

wet season. A beginning has also been made on a comprehensive survey of Nigerian types of chickens and selected pens of birds have been established with the object of studying their merits and the most suitable lines for their development and improvement. The question of disease control and the breeding of healthy stock is the most serious problem to be faced at the Oyo Poultry Farm. There has already been one outbreak of fowl pox amongst the adult stock which resulted in minor losses. Every precaution is being taken to guard against the occurrence of serious epidemics and if a satisfactory control can be maintained, excellent results should be obtained.

PIGS

7. Two important points have emerged from our work in connection with pig keeping in the Western Provinces, namely, that the risk of infection with trypanosomiasis is very much greater than was originally thought in all parts of the Western Provinces ; and secondly that cross bred pigs do not appear to be any more tolerant to the disease than pure bred stock. Trypanosomiasis infection is believed to be one of the most important causes of the somewhat poor results obtained by private pig keepers. In addition, considerable difficulty is frequently experienced in obtaining some of the essential food stuffs and mineral constituents of the ration. The screening of pens with a suitable type of locally made mat offers an easy solution to the first problem, and suitable methods for regularising the supply of food stuffs of the right kind are being investigated.

FODDER AND PASTURES

8. In the savannah districts of the Western Provinces, the provision of adequate grazing for cattle presents comparatively little difficulty since grass comprises the greater part of the natural vegetation of the area. This is not so in the forest districts of the Region and the management of cattle will inevitably involve a much greater emphasis in the management of grasslands for the provision of cattle fodder and for grazing. Most of the basic research work on grasses and grassland management is at present being carried out at Moor Plantation and to a lesser extent at Agege in connection with the dairy. The main lines of investigation consist of the following :—

Grass collections from all over Nigeria and introductions from overseas.
Establishment of pastures with local and introduced species.
Grass variety and manurial trials.
Frequency of cutting experiments.
Dry season management of grasslands.

The grass collection has already yielded several very promising types. Some of these have been established as pastures and others as fodder grasses for cutting and stall feeding. The following table summarises average yields of edible fodder per acre over the three year period 1945-47 inclusive.

Species	*Average yield per acre (tons)*
Fodder Cane No. 5	7.1
Fodder Cane No. 7	6.7
Fodder Cane No. 9	7.4
Para Grass	8.3
Guinea Grass	8.9
Elephant Grass	12.0
Ibadan Gamba Grass	4.4
Ilorin Gamba Grass	11.5

The manurial trials and frequency of cutting experiments were only started in 1948 and as the grass year is divided into the two periods late March to mid November (wet season) and late November to mid March (dry season) results for the first year are not yet available.

EXPERIMENTAL UNIT FARMS

9. There were seven Unit Farms in operation during the year. Unit Farm No. 5 has been closed owing to an unsatisfactory tenant but it is proposed to reopen the farm on a new site as soon as possible. Results obtained from these farms since their inception in 1944 were carefully analysed at the end of 1947. Certain modifications, particularly in the rotations, have been made in order to meet the essential requirements of labour and food of the various family units and their stock, with the object of improving the economics and efficiency of the farms.

A summary of the gross profits for the period 1946-48 is given in the following table :—

Unit Farm	*Total Acreage*	*Number in Family*	*Gross Profits*		
			1946 £ s d	1947 £ s d	1948 £ s d
1	13.5	Farmer and two boys	29 6 3	18 17 11	24 1 2
2	7.5	Farmer, one wife and 3 children	25 4 1	23 8 11	30 16 10
3	7.5	Farmer, one wife, 2 children	19 5 1	26 12 3	33 17 1
4	7.5	Farmer, one wife, one child, one boy.. ..	6 14 9	8 5 6	15 14 7
6	10.2	Farmer, one wife, 3 children, one boy ..	20 19 1	62 9 10	70 11 1
				loss	
7	7.5	Farmer, one wife, 2 children	20 8 9	0 14 7	20 11 10
8	7.5	Farmer, one wife and sister, 2 children and boy	27 8 3	6 19 2	44 0 1

OYO FARM SCHOOL

10. The early promise of a proportion of the Farm School settlers who appeared to be making a success of their farms has not been fulfilled. A number have left their farms for alternative employment and others have not maintained a high standard of farming. There has also been renewed difficulty in obtaining the requisite number of applications for scholarships from the elementary schoolboys of Oyo Division. This is attributed to an unwillingness on the part of the schoolboys to become farmers and of their parents to encourage or allow them to do so. In addition there has been lack of enthusiastic support from the staffs of elementary schools and lastly the Agricultural Department itself has suffered from inadequate Senior Service Staff to provide the necessary supervision and continuity. As the Farm School has been in operation for six years a thorough investigation is being made into the progress of the students who have passed through with a view to revising, if necessary, the present policy of recruitment, training and settlement. There are indications that better results might be obtained with illiterates and a revised system of training which combines vocational instruction in Agriculture with sufficient general education to make the trainees literate is under consideration.

It is important at this stage to review the position with some thoroughness as the imagination of other Provinces has been fired by this experiment and the demand for more farm schools has been stimulated. A second Farm School has in fact already been established at Ogbomosho with Colonial Development and Welfare funds and was ready for occupation by the first class early in 1949.

The special ex-servicemen's course to which reference was made in the Annual Report for 1947 was completed, and twenty-two out of twenty-four entrants have passed out of the school to settle on their own farms.

There is one important conclusion which can be drawn from the school since its commencement in 1942, and that is the soundness of the systems of mixed farming which are being taught there. The results obtained over a six year period on the most popular of the training farms are worthy of reproduction as they provide evidence that a well balanced system of husbandry embracing an efficient system of organic manures, is capable of maintaining crop yields at an extremely high level over a period of years. The crop yields quoted below were obtained on Training Farm No. 2 which has 4 acres of arable land cultivated by hand. The livestock consists of one bull, four cows, and seven calves. All farm yard manure is returned to the land.

CROPS

Year	*Yams*	*Early Maize*	*Late Maize*	*Cassava*	*Guinea Corn*	*Cowpeas*	*Melon*
1943	360	1,238	372	10,540	206	104	143
1944	14,767	1,460	631	—	631	48	184
1945	11,365	2,360	737	23,840	757	70	440
1946	9,880	1,831	829	16,645	1,240	104	369
1947	14,858	1,225	910	7,361	1,272	169	382
1948	15,247	1,791	1,050	—	1,185	8	325
Average	11,079	1,651	750	14,596	882	84	307

OIL PALMS

11. (*i*) *Extension Work.*—A small acreage of palms were planted in the following Provinces :—

Warri	.. 11 acres.
Ondo	.. 39.31 acres.
Oyo	.. 22.00 acres.
Abeokuta/Ijebu	.. Nil (weather too dry)
Total	.. 72.31 acres.

Schemes which include intensification of planting on sound lines with improved seedlings bred by the Oil Palm Research Station are being prepared by the new Western Region Oil Palm Production Development Board. This Board, on which the Department is represented, is planning for greater efficiency and productive capacity of the industry to enable it to compete with other producing countries, by the progressive replacement of wild growth with palm plantations and by advocating the use of Pioneer Mills. To this end surveys of sites likely to be suitable for the establishment of oil mills by the Department of Commerce and Industries have been carried out. Two sites have already been selected in Warri Province and one in Abeokuta Province. More are under investigation.

(*ii*) *Gradings for* 1947.—The total tonnages of palm oil and palm kernels graded in the Western Provinces and the Colony show an increase over figures for 1947.

The comparative tonnages are given in the following table :—

	1947		1948		*Increase or Decrease*	
	Oil	*Kernels*	*Oil*	*Kernels*	*Oil*	*Kernels*
Western Provinces	23,259	134,153	23,533	147,194	+274	+13,041
Colony	191	14,655	85	15,946	—106	+ 1,291
Total	23,450	148,808	23,618	163,140	+168	+14,332

COCOA

12. The development of the Cocoa Industry and the problems connected with the control of Swollen Shoot disease engaged the attention of the Western Provinces staff to a very great degree during 1948. The successful execution of the programme of work necessitated close collaboration with the Administration and the Produce Inspection Branch of the Department of Marketing and Exports. It is gratifying to report that this co-operation was well maintained.

The Cocoa Marketing Board.—Most of the Department's work in connection with cocoa is now financed by the Cocoa Marketing Board. In this respect the Department has now become an agent of the Board for the purpose of carrying out various schemes for the development of the industry. The Board's assistance in this connection takes the form of a grant to Government in reimbursement of actual expenditure appearing in the Estimates.

Five Agricultural Schemes have so far been approved by the Cocoa Marketing Board. These are :—

(1) Nigerian Cocoa Survey.

(2) Cocoa Soil Survey.

(3) Investigation into the Economics of the Cocoa Industry.

(4) Improvement of Quality of Cocoa.

(5) Long Term Rehabilitation and New Planting of Cocoa.

The Department is represented on the Marketing Board by the Director of Agriculture and on the Advisory Committee by the Regional Deputy Director of Agriculture thus ensuring close liaison between the Board and the Department.

Of the five schemes listed above three are in operation and a brief review of the work done during the year is given below.

(1) *Nigerian Cocoa Survey.*

(*a*) *Routine inspection of Farms.*—The preliminary survey of cocoa farms which was begun in September, 1944, would have been completed during 1948 but for the disturbances which occurred in July in connection with the Swollen Shoot cutting out Campaign. Up to this point the survey had proceeded smoothly and had in many cases been welcomed by the farmers, who received much valuable advice in connection with the maintenance of their farms, and the method of preparation of their cocoa

beans for market. Pending a settlement of the cutting out campaign dispute all survey work was suspended in Oyo Province with the result that the survey could not be resumed until December. Only a very small area remained to be surveyed at the close of this year.

The following tables analyse the principal results of the survey to 31st December, 1948, since it began; a few farms in Oyo and Ilorin Provinces still remain unsurveyed.

TABLE I

GENERAL SURVEY

Province	*No. farms Surveyed*	*Acreage of farms surveyed*	*Average size of farms (acres)*
Oyo	207,393	336,424	1.6
Abeokuta	36,084	55,258	1.5
Ijebu	14,404	20,655	1.4
Colony	1,951	3,670	1.9
Ondo	50,126	105,928	2.1
Benin	6,508	14,910	2.2
Warri	934	628	0.7
Kabba	1,283	3,208	2.6
Ilorin	717	461	0.5
Owerri	209	945	4.5
Calabar	893	725	0.8
Onitsha	25	4	0.2
Ogoja	425	1,667	7.6
Cameroons	8,127	48,915	6.9
Total	329,079	593,398	1.8

TABLE II

AGE GROUP DISTRIBUTION IN PRINCIPAL COCOA GROWING PROVINCES EXPRESSED AS PERCENTAGES OF AREA SURVEYED

Province	0-10 *years*	11-20 *years*	21 *years and over*
Oyo	13.7	48.3	38.0
Abeokuta	20.5	48.4	31.1
Ijebu	13.2	67.7	19.1
Colony	15.2	30.1	54.7
Ondo	30.9	62.2	6.9
Benin	74.4	24.9	0.7
Kabba	77.4	20.8	1.8
Cameroons	5.6	37.7	56.7
Ogoja	81.7	14.3	4.0

(*b*) *Control of Swollen Shoot Disease.*—As far as is known the occurrence of Swollen Shoot disease is restricted to an area within a thirty miles radius of Ibadan. This includes some of the most densely planted cocoa land of the Western Provinces and it is of the utmost importance that the disease should be brought under control as swiftly as possible. Eradication by cutting out was started in 1946 and proceeded steadily with

comparatively little interruption until July, 1948, when strong opposition arose and assumed such serious proportions that the cutting out campaign had to be suspended. By this time some 525,000 infected trees had been destroyed which is equivalent to 1,050 acres of cocoa. The preliminary treatment of all known infected farms was approaching completion and several outbreaks were believed to have been satisfactorily cleared of the disease. The suspension of control at this stage must inevitably prove a costly business as the disease has been allowed to continue to spread unchecked thereby causing the infection of many healthy cocoa trees which might otherwise have been saved. A long period of patient negotiation by the Administration with the principal agents of the opposition has ensued, and a further party of representatives of farmers and the press has been to the West African Research Institute on the Gold Coast, and have been shown the devastation which the disease has caused there. By the close of the year it is gratifying to record that agreement had been reached for cutting out to be resumed under European supervision early in the new year as soon as the 1948-49 main crop harvest is complete.

(*c*) *Compensation.*—In view of the increased prices paid for cocoa during the 1948-49 season the rehabilitation grant of 1s 6d per tree which the Cocoa Marketing Board had agreed to pay for all cocoa trees destroyed has had to be reviewed. The Board has accordingly consented to an increased payment to 2s 6d per tree with no proviso regarding replanting.

(*d*) *Observation Plots.*—If the Department is to offer the Nigerian Cocoa farmer the maximum amount of useful advice on the planting, cultivation, harvesting and rehabilitation of cocoa, it is essential that as much information as possible should be obtained regarding the methods employed by cocoa farmers throughout the country. This information can best be obtained by a close study of local practice on selected cocoa farms in all the principal cocoa growing districts. A series of Observation Plots have accordingly been taken over at suitable centres for the purpose of carrying out the following studies :

(*i*) To determine the relationship between the age and yield of cocoa on farms in different areas, and on different soils.

(*ii*) To make a detailed study of farming practice in the management of cocoa.

(*iii*) To compare departmental methods of maintenance (including the influence of shade) with farmers' practice.

(*iv*) To study the incidence of diseases and pests on cocoa farms and to demonstrate methods of control.

(*v*) To study the influence of climate, particularly rainfall on cocoa yields.

Wherever possible these Observation Plots are divided into two, one plot being managed by the farmer and the other by the Department. On the latter, various cultural methods are introduced which it is believed will bring increased returns to farmers, and it is hoped that they will serve as valuable demonstration centres for the district in which they are located. It should be explained that on all plots whether managed by the farmer or the Department the cocoa remains the property of the owner after the

necessary records have been obtained. Results obtained from the first season of operations indicate a considerable improvement in yield from departmental plots largely as a result of the black pod control measures employed. However, the disease generally has not been severe this season and the success achieved should only be reviewed with cautious optimism at present.

(*e*) *Quality Improvement Campaign.*—The campaign to improve the quality of Nigerian Cocoa was started in July, 1947, and was continued with increased intensity throughout the 1948-49 season. The results obtained after the first season's operation brought encouraging tributes from the trade. Further considerable advances have been made during the 1948-49 season. The following table summarises the improvement achieved since the commencement of the campaign in 1947.

Old Grade	*Maximum permitted allowance for unfermented or insufficiently fermented beans*	1946	*New Grade*	*Maximum permitted allowance for unfermented or insufficiently fermented beans*	1947-48	1948-49
I ..	5 per cent	14.9	I	5 per cent	47.0	79.7
II ..	10 per cent	0.9	II	10 per cent	24.7	16.1
	15 per cent	6.9	—	—	—	—
	20 per cent	14.4	III	20 per cent	21.3	2.8
	30 per cent	31.2	IV	No limit	7.0	1.4
	30 per cent and over	31.7	—	—	—	—
		100.0			100.0	100.0

Three factors have contributed to these results :—

(*a*) Improvement in price of cocoa, with a bigger premium for high quality cocoa.

(*b*) Very firm control by the Produce Inspection branch of the Department of Marketing and Exports.

(*c*) Farm-to-farm propaganda and instruction on fermentation and prevention of contamination by measures to prevent ingress of small livestock. Small traders and middlemen are still capable of improvement in this last respect. The direct cost of the 1946 campaign was approximately £200, apart from the cost of the part-time services of staff provided for under other sub-heads of expenditure.

(*f*) *Long Term Rehabilitation and New Planting of Cocoa.*—In spite of a most unfavourable planting season, progress has been made with the multiplication plots in which improved types of cocoa are being planted to provide seed for farmers. An unseasonable drought in July and August and a severe onset of the dry season at the end of the year caused the death of many young cocoa plants. This will delay the planting schedule to some extent, but arrangements for planting in the rains of 1949 are well in hand. Planting material is ready not only for supplying the losses, but also for planting an additional area at the Ibadan Native Administration Farm, and on land which has been selected near Ondo, Ilesha and Ife. While the type of cocoa which is at present being planted in these multiplication plots is the improved local strain T38, selected for the large size of its beans and for above-average yield, it is hoped as soon as material becomes

available to make use of the introduced types from the Upper Amazon, which at Tafo are giving early yields greatly superior to any other West African selection. The first of the South American introductions, received as budwood from the Gold Coast were planted out at the Ibadan Native Administration Farm last season and are surviving the rigours of the drought. In December half a dozen pods were received from Tafo from which seedlings are being raised, and it is hoped that a much larger number will come forward in 1949. Careful precautions have to be taken in the despatch, receipt, and growing of these seedlings to ensure that their introduction from the Gold Coast is not accompanied by any risk of virus infection.

FRUIT

13. (*i*) *Nurseries.*—The following table gives particulars of the more popular types of fruit trees distributed from Government and Native Administration nurseries in 1947 :—

Province	*Sweet Orange*	*Grapefruit*	*Tangerine*	*Mango*	*Avocado*
Oyo (M.P.) to farmers ..	207	88	—	14	2
Abeokuta, Ijebu-Ode	546	100	32	—	—
Ondo	583	35	97	115	40
Colony	320	162	75	5	5

Distribution was much restricted owing to dry weather in June and July planting season.

(*ii*) *Fruit Products.*—The Blaize Memorial Institute products continued in popularity. The quantity of fruit used and volume of output are summarised in the following tables :—

Year	*Production of Fruit Squashes (bottles)*	*Lime Juice export to South Africa (gal.)*	*Marmalade, Jellies and Jams (lb)*
1941 ..	13,411	—	17,321
1942 ..	77,000	—	108,776
1943 ..	213,314	—	79,865
1944 ..	160,387	2,000	153,487
1945 ..	164,121	12,365	11,911
1946 ..	171,766	1,150	1,722
1947 ..	163,249	—	6,372
1948 ..	125,140	—	1,000

Summary of Fruits used.

Fruit	1946	1947	1948
Grapefruit	298,301	231,098	195,787
Lemons	31,342	37,903	49,826
Oranges	1,135,914	806,139	1,139,863
Limes	1,310,933	530,704	474,740
Tangerines	49,282	159,716	32,948
Pineapples	12,774	9,091	6,389

(*iii*) *Export of Fruit.*—During the war years the market for citrus fruits and fruit products expanded very considerably, mainly as a result of the demand created by the fighting services which were stationed in large numbers in the country. The natural outcome of this was increased planting by farmers particularly in Abeokuta and Oyo Provinces and the Colony. Although a valuable internal trade in fresh fruit and fruit products was built up, it has not been possible to maintain consumption at the war time level. There is in consequence a certain post war surplus production of grapefruit for which the Department has been endeavouring to find a suitable market. Investigations into the possibilities of developing an export trade in fresh fruit with the United Kingdom have been made and a trial shipment of Marsh seedless grapefruit was sent to the Ministry of Food from Abeokuta and the Colony during November.

It is not, however, always appreciated that the quality of fruit, particularly as regards external appearance, required by overseas markets is of a very high order indeed and whilst the eating quality of Nigerian grapefruit may be fully equal to supplies from other sources, only a proportion of the fruit fulfils overseas market's requirements as regards appearance. It is emphasised that a suitable market must first be found for this unexportable portion of the crop before any regular export trade in fresh fruit can be contemplated. Negotiations are in progress with the Fruit Products Division of the Ministry of Food with a view to developing an export trade in citrus juices. Samples of orange, grapefruit, lemon and lime juices have been forwarded to the United Kingdom. If the report on these samples is satisfactory and market prospects for raw juice are reasonably favourable it should be possible to formulate a more positive policy for development of the citrus industry in the Western Provinces. In the meantime efforts will not be relaxed to develop and extend, wherever opportunity exists, the internal trade in fresh fruit, squashes and canned fruit.

NIGERIAN BIRDSEYE CHILLIES

14. This crop at the best of times is a precarious one for any buyer to handle owing to the vagaries of the market and the overall requirements which are never very great. During the war years when purchase was subject to Government control with Messrs John Holt and Co. acting as buying and selling agents for Government the farmers were at least certain of a market for their crop at a fixed price. With the cessation of hostilities and the gradual return to normal trade conditions the market in Nigeria was freed to any buyer who wished to participate in the trade. The results of this change have not proved very satisfactory for the farmers, and this season no buyers came forward when the crop was ready for harvest. The situation became disastrous, as the chillies rapidly deteriorate after picking, and by December when Government was ultimately obliged to handle the crop through the Agency of Messrs John Holt and Co., the crop had deteriorated to below the minimum standards of Grade III and only 5 tons were actually purchased. What the future of this business will be is at present undecided.

RICE

15. The season generally was favourable for upland rice and good yields were obtained in Ondo Province where there has been a steady increase in planting. Response to propaganda with swamp rice in creek areas is less encouraging. The crop under these conditions is admittedly difficult to grow owing to the wide fluctuation in water levels from year to year and it frequently involves a considerable amount of labour in the initial preparation of the swamps. Nevertheless, some excellent yields have been obtained on demonstration plots in creek areas where most food crops are difficult to grow.

Rice Mills.—The rice mill opened at Ughelli in Warri Province in 1947 has been managed by the Administration since August when the Provincial office at Benin had to be closed. This mill has been very well patronised by the people and has been in constant operation throughout the year. It has undoubtedly stimulated a keen interest in the cultivation of rice in the district. Mills have also been in operation at Ekpoma (Benin Province), at Ondo, and at Wasimi (Abeokuta Province). In all cases the paddy is parboiled by the growers before they bring it to the mill and the rice is hulled at a fixed charge per lb. From the results obtained so far it would appear that provided the milling rate is not less than 3s 6d cwt. the mills can be run at a profit if they are in constant use throughout the year.

COTTON

16. There has been no revival of the export of cotton from the Western Provinces and the review of position given in the last Annual Report still holds good. The quantity of cotton ginned at Ibadan Ginnery for export in 1947-48 was ninety-three bales of 400 lb weight. The Oshogbo Ginnery did not operate.

TOBACCO

17. The British American Tobacco Company suffered a less disappointing year than was expected in their efforts to increase the production of locally grown American leaf. The season was unfavourable and though yields were greatly reduced by leaf curl in the flue curing district of Ago-Are, the losses were much less on the air cured crop of Ogbomosho and Oyo districts. The total crop was the highest since 1941.

A fertilizer experiment was laid down for the Company at Ago-Are and the collaboration of the Company was sought in preparing air cured samples of local strains of tobacco grown by farmers. Previous samples sent to the Imperial Institute indicated that local types might be suitable for export to certain specialised markets, if properly prepared.

TETRACARPIDIUM CONOPHORUM

18. The trials of *Tetracarpidium conophorum* which were laid down late in 1947 were continued. It has been found possible to bring individual plants into bearing at three years instead of the five years originally estimated. Growth on the trial plots is irregular but satisfactory results are obtainable if the seed is fresh, planted in reasonably

fertile soil under light shade and against a secure support for the vine. Planting must be done as soon as fresh seed can be obtained in June, so that the plant is well established before the dry season. If the plant is enabled to reach light at about 8 feet to 10 feet high, the growth of secondary shoots which bear the flowers will be accelerated. Cultivation in this fashion is easily within the capacity of the ordinary farmer.

HEVEA RUBBER

19. With the improvement in prices, production of all grades of plantation rubber increased to 3,799 tons compared with 3,284 tons in 1947. Only 7½ tons of Grade I sheet rubber which now is valued at 9d per lb were graded.

AGRICULTURAL SHOWS

20. Moor Plantation held its Third Farmers' Week in July and there was a departmental exhibit at the fourth Oyo Exhibition. The second agricultural show at Badagry failed to attract the quantity of exhibits expected but the quality of some individual exhibits was good.

MECHANISATION TRIALS

21. Some preliminary mechanisation trials have been made with light and medium tractors drawing a range of implements. At Agege tests with a light unit showed that, though capable of working an impressive range of implements, it could only do so on light soils. Further trials are necessary as conflicting results were obtained with the same make of machine in the Northern Provinces. A Fordson utility tractor drawing a well known make of three-furrow plough and disc harrow was tried at Moor Plantation. The plough failed to cope with tough weeds and grass, and became severely clogged even when the disc coulters were removed. The disc harrow was also unsatisfactory for this class of work and it was evident that a disc plough would probably solve this particular problem. When the mechanisation unit for which financial provision has been made in the estimates for next year is in operation it should be possible to widen very considerably the range of tractor types and implements.

A. V. Gibberd,
for Deputy Director of Agriculture,
Western Provinces

Agricultural Department,
Ibadan, 22nd April, 1949

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STAFF AND GENERAL

The shortage of trained and in particular experienced Senior Service staff has continued to hamper progress though there was some improvement in the latter half of the year by the posting of one lady Agricultural Officer and two Agricultural Superintendents—all new appointments—to the Region. In addition, one Agricultural Officer was transferred from the Western Provinces to assist in the Regional Headquarters' office. The inadequacy of the number of Specialist staff in the Department has precluded the posting of any Specialist Officers to the Eastern Provinces, and it has been necessary to rely on the supervision of botanical and other specialised work by touring officers from the Oil Palm Research Station, Benin, and from Ibadan. In the absence of Senior Service officers, Assistant Agricultural Officers and Agricultural Assistants of the Junior Technical service have had to shoulder added responsibilities and every opportunity has been given them to demonstrate their ability.

2. *New Stations and Prospects.*—The development of the new Experimental Farm at Abakaliki which was opened during 1947 progressed satisfactorily. This farm is being laid out entirely on the contour and strict contour farming is being undertaken from the start. Though a beginning was made with experimental cropping, the work in the main was devoted to the construction of contour banks, diversion ditches and some progress was made on contouring. Considerable building work was also undertaken. Mention was made in last year's report of the difficulties and delays in obtaining sites for the new Experimental Farm and Oil Palm Research Sub-station in Calabar Province. Negotiations for sites were continued this year and it is gratifying to report that by the end of the year, an area of approximately 260 acres, situated between mile three and four on the Abak-Ikot Okoro road, was acquired for development as the Provincial Experimental Farm, while the negotiations for the site for the Oil Palm Research Sub-station is nearing completion. Preliminary steps have been put in hand for the selection of a site for the Provincial Experimental Farm in the Rivers Province, but rapid progress with this cannot be expected until further Senior Service staff is available.

A start was made during the year in the selection and opening up of sites for Demonstration Farm Centres. The purpose of these farm centres was explained in last year's report, and is, briefly, that they are intended to serve as foci for extension work by the demonstration of improved agricultural practices and by the propagation and distribution of improved planting material. It is intended, where possible, that these farms should be of 10 to 20 acres in extent, but difficulties have already been encountered in obtaining areas of this size and we have had to be content in some cases with sites of under 10 acres.

Preliminary work in clearing has been commenced at six farm centres situated as follows :—

Bansara	.. ..	Ogoja Division of Ogoja Province.
Isiokpo	.. ..	Ahoada Division of Rivers Province.
Akwete	.. ..	Aba Division of Owerri Province.
Ohoba	.. ..	Owerri Division of Owerri Province.
Abo	.. ..	Owerri Division of Owerri Province.
Ukpabi	.. ..	Nsukka Division of Onitsha Province.

Arrangements are also in train to open a centre on Government land at Oron in the Calabar Province, and at Banso in the Bamenda Division.

THE 1948 SEASON

3. In general, rainfall was slightly above the average in most districts, and well above in Uyo and Bamenda, where 10 and 15 inches above normal respectively were recorded. The rains were rather late in arriving, but subsequently fell without serious break until the end of October, though in parts of Ogoja irregular and badly spaced falls had an adverse effect on the rice crop. In the Anam area (Onitsha Province), heavy rain in August caused early flooding of the Niger which resulted in some loss in the early yam crop. In the main, however, crops were well up to average. Food supplies remained normal, but prices remained high and in some areas showed an increase on last year's level. The season has been a particularly favourable one for the oil palm.

Typical rainfall records are given in the following table :—

Month	*Umuahia*		*Uyo*		*Nkwelle-Onitsha*		*Abakaliki*		*Bamenda (Bambui)*	
	1948	26 *yrs. Av.*	1948	11 *yrs. Av.*	1948	17 *yrs. Av.*	1948	10 *yrs. Av.*	1948	4 *yrs. Av.*
	ins.	*ins.*	*ins.*	*ins.*	*ins.*	*ins.*	*ins.*	*ins.*	*ins.*	*ins.*
January	0.51	0.93	1.49	2.01	0.31	0.55	0.33	1.17	0.67	0.99
February ..	2.25	2.06	0.70	3.22	0.28	1.29	2.01	1.74	0.51	1.28
March	2.23	5.11	1.73	5.86	2.50	2.19	1.05	1.74	4.54	3.28
April	13.60	7.61	9.80	8.50	5.65	6.23	7.99	4.72	8.49	8.66
May	6.77	10.27	10.84	11.37	6.84	8.74	6.21	9.06	6.88	8.16
June	10.73	12.15	11.10	9.53	9.56	9.55	7.60	10.10	17.85	11.69
July	15.93	11.52	12.80	11.77	17.32	10.57	12.71	11.77	17.34	13.70
August	11.65	10.35	12.26	11.21	5.88	8.87	14.40	9.75	18.84	13.18
September ..	15.44	13.35	23.42	13.67	11.32	11.48	12.92	12.98	17.91	15.95
October ..	8.37	11.26	15.09	11.66	7.42	10.05	12.69	11.30	7.52	10.59
November ..	2.53	3.45	6.49	5.40	2.39	2.31	1.46	2.34	2.17	1.53
December ..	0.24	0.82	—	1.72	—	0.49	—	0.35	3.42	1.73
Totals	90.25	88.88	105.72	95.92	69.47	72.32	79.37	77.02	106.14	90.74

ANIMAL HUSBANDRY

4. *Cattle and Sheep.*—Cattle and sheep maintained at Nkwelle and Umudike farms for the purpose of investigating management, feeding and disease problems, and of producing manure for manurial experiments had a particularly good year, and losses except of sheep by theft at Nkwelle, were negligible. Grading of shorthorn to N'dama was continued, but progress was hampered by lack of suitable bulls. New N'dama stud bulls were ordered from the Stock Farm but had not arrived by the end of the year.

The sheep at Umudike have done particularly well and with the birth of a large number of twins, the stage has now been reached when it is possible to cull the herd so that it is made up entirely of rams and ewes that are either twin born or are known to throw twins frequently. A beginning has been made at Abakaliki towards building up foundation herds of sheep and cattle. In regard to the latter it is intended to start

with a contagious abortion free herd, and only animals showing negative reactions to agglutination tests are accepted into the main herd. A contagious free N'dama bull is being obtained from Ilorin.

The herd of Zebu cattle at Bambui farm now consists of over 150 head of stock. Cattle improvement work was continued using a White Fulani bull (*ex* Shika), a Gudali bull of the Ngaundere type (*ex* Esosong) and a Gudali bull (*ex* Jakiri) of the Banyo type as stud bulls on the foundation breeding stock. The results obtained with the Fulani bull have proved disappointing and his progeny appear not to be as suitable for the area as the local Gudali types. Calves sired by the pure Gudali bull of the Ngaundere type have made better growth than calves sired by the other two stud bulls. It is intended to replace the present Jakiri bull with another from Jakiri of the local type and the main breeding for 1949 will involve the use of the new bull and the Esosong bull.

5. *Pigs.*—Trials of keeping European breeds of pigs under fly-proof conditions at Umudike and Nkwelle continue to give evidence that this is a promising line of work, and this year's experience, particularly at Nkwelle, has confirmed that, provided feeding and management are maintained at a very high level, pig-keeping under these conditions can be profitable. At Nkwelle some excellent live-weight increases have been registered and latterly 180 lb live-weight has been reached in a little over six months and in some cases in five and a half months ; pigs putting on nearly 2 lb a day in the later stages. As has been emphasised in past reports, the greatest problem at the present time, given good management, is the shortage of protein rich foods from local sources which makes it necessary in order to obtain a satisfactory ration to purchase palm kernel and groundnut meal which are expensive and in short supply.

Breeding and feeding trials with Large White, Tamworth and Berkshire breeds continued at Bamenda, and a start has been made towards building up a foundation herd at Abakaliki.

By the end of the year there were sixteen approved private piggeries in operation and one piggery nearing completion. Two piggeries in Calabar were written off as the owners have consistently refused to take our advice. Of those which are going concerns, only three or four can be said to be running really satisfactorily. The majority of pig-keepers fail to give adequate attention to management, and tend to cut costs on feeding stuffs and on the upkeep of their buildings, many of which are far from being fly-proof. The worst offenders are those who have other interests and run piggeries merely as a side-line employing someone to manage them. This year's experience has clearly shown that unless a pig-keeper is prepared to give his piggery his personal and unremitting attention, and is prepared to abide strictly by our advice in the matters of management and feeding, the venture is almost certain to fail.

6. *Poultry.*—Strenuous efforts to increase the numbers of improved cockerels and pullets (R.I.R.) for distribution resulted in some success. This was in some measure due to the introduction of new importations from the Oyo Poultry Farm of forty cocks and ten hens, which were welcome additions to our breeding flocks at Umudike and Nkwelle, where there were indications that the quality of poultry was degenerating through in-breeding. The total number of birds distributed during the year was 486 which compares favourably with the total of 270 for 1947. Nevertheless the demand still far exceeds the supply. In addition 1,170 hatching eggs were distributed compared with 500 in 1947.

An experiment at Umudike in the keeping of ducks partly fed on waste pig food is proving a success ; the ducks bred on the farm being considerably heavier than their parents.

7. *Fodder Crops and Pastures.*—The work on fodders including legumes and pasture grasses described in last year's report was continued, and the results generally confirm that reasonably heavy manuring is necessary to maintain yields particularly of the fodder plants on the acid sandy soils of the Eastern Provinces. At Umuahia yields were heavier than in 1947, and results show that farm yard manure with and without lime, lime alone, and a complete dressing of N.P.K. all have beneficial effects with the balance in favour of farm yard manure plus lime. From the point of view of yield, molasses grass proved the highest yielder followed by *Panicum maximum* and *Andropogon gayanus.* These grasses are all relished by stock, and molasses grass, which seems to thrive on poor soil and which occurs in a natural state, should prove especially useful. A new legume, Brazilian Lucerne, recently introduced and raised in a small trial plot has done well and was greatly relished by the pigs, though cattle and sheep found it unpalatable. It is, however, premature to draw conclusions from this trial as the amount available for feeding was very small.

Investigations on improvement and management of pastures were continued and extended at Bambui. These include a series of trials of controlled grazing at different rates of stocking and comparisons of such treatments on early and late burning and early and late cutlassing. Of the introduced grasses, Kikuyu grass obtained from East Africa has proved popular in the Bamenda region for growing on eroded areas and there has been an increased demand for root cuttings, which has been met from supplies available at Bambui farm.

Trials of simple and cheap methods of silage production have been continued at all experimental stations with satisfactory results, and there is every prospect of developing silage production as a practicable and economic method of utilizing grasses and forage legumes for dry season feeding.

SOIL FERTILITY

8. The problem of maintaining soil fertility remains the most pressing problem in the Eastern Provinces where increasing population is resulting in a progressive increase in the area of land under cultivation with a corresponding reduction in the recuperative fallow period. The acid sandy soils which constitute a great part of the Eastern Provinces are inherently poor and markedly lacking in humus. The difficulty of practising mixed farming owing to the incidence of trypanosomiasis and other factors, militates against the application of the usually accepted methods of supplying organic manure to the soil. It thus seems that an alternation of cropping and fallow must remain an essential feature of the Agricultural economy of most of the Eastern Region, and the use of inorganic fertilisers is likely to be essential in order to achieve and maintain the increased productivity necessary to support the ever expanding population. The comprehensive experimental programme of work undertaken at Nkwelle and Umudike farms concerning artificial fertilisers, lime, shrub fallows and organic manures was continued and further expanded, and additional information obtained. This report is not the place for the presentation of detailed results and discussion of this work. These will be published in the Departmental Bulletin.

9. *Inorganic Fertilisers.*—The Department has pressed on with artificial manurial experiments, and in addition to those on our farms, nineteen experiments were laid down on land outside our farms, mainly on farmers' land, to determine the effects of

artificial manures under as varied conditions as possible. The experiments were kept uniform and were of two types, the type selected being determined by the amount of land available.

The first, a factorial experiment involving twenty-seven plots to test the effects at two levels of various combinations of N.P. and K., all plots receiving a basal dressing of 10 cwts lime per acre. Applications of fertilisers were at the following rates :—

N (Sulphate of Ammonia) Nil, 1½ cwts per acre and 3 cwts per acre.
P (Superphosphate) Nil, 1½ cwts per acre and 3 cwts per acre.
K (Muriate of Potash) Nil, ¾ cwt per acre and 1½ cwts per acre.

The second type was a factorial experiment to test the effect of various combinations of N.P.K. and lime at one level of application involving two blocks of eight plots, rate of application being :—

N (Sulphate of Ammonia) at Nil rate *v* 1½ cwts per acre.
P (Superphosphate) at Nil rate *v* 1½ cwts per acre.
K (Muriate of Potash) at Nil rate *v* ¾ cwt per acre.
Lime at Nil rate *v* 10 cwts per acre.

These experiments were laid down at the following centres :—

Province	*27 Plot Experiments*	*" Double 8 " Plot Experiments*
Owerri and Rivers..	Isoba	—
	Obohia	Ihie Ngwa
	Aba	Orlu
	Owerri	—
Calabar	Oron (Eket Division)	—
	Asutan Ekpe (Uyo Division)	Arochuku
	Ikot Akan (Opobo Division)	Calabar
Onitsha	Ikwoka (Nsukka Division)	Ihiala, Ozubulu (Onitsha Division) ; Oku (Awka Division) ; Ugboka (Udi Division)
Ogoja	Ikwo	—
	Akaeze	Ezza

In as many areas as possible simple demonstration plots were laid down by the side of the more complex experimental area.

The results of many of the experiments and demonstrations have yet to be worked out and analysed, but such information as is available tends to confirm previous results in showing that Sulphate of Ammonia has been the main factor in the majority of experiments which have been worked out, in increasing yields of crops grown on the acid sandy types of soil. There is, however, evidence that under certain conditions potash can be the principal factor in increasing yields. This was clearly demonstrated in the twenty-seven plot factorial experiment on Umudike farm.

In the twenty-seven plot experiments at Nsukka, with maize there was an increase of 1,218 lb of cobs per acre due to the 3 cwts of Sulphate of Ammonia per acre and an increase of 386 lb of cobs from the dressing of 1½ cwts of Muriate of Potash per acre. There was also a positive interaction N × K and a strong indication that 3 cwts of Sulphate of Ammonia is a heavier dressing than is economical. With yams the 3 cwts per acre of Sulphate of Ammonia produced an increase of 1,563 lb net of tubers.

At Abakaliki where the soil is of a different type to the acid sands, there has been as significant response to Phosphate as well as to Nitrogen.

From the economic standpoint the evidence to -date suggests that single dressings of N.P.K. (1½ cwts Sulphate of Ammonia, 1½ cwts Superphosphate, ¾ cwt Muriate of Potash per acre) are likely to prove more economic than the double dressings. In Calabar Province for example, five of the seven demonstrations showed a monetary profit from single dressings varying from £3 4s 6d to £16 0s 9d per acre with an average of £5 7s 5½d per acre, while from double dressings only two of the demonstrations gave an economic return. Nevertheless the fact that in two examples out of seven higher dressings have proved the more economical, makes it clear that further investigations are necessary to enable us to give more exact advice on the most economic dressings to be applied under the varying conditions met with in the Eastern Provinces. Details of the returns from the Calabar Province Demonstration plots are as follows :—

ARTIFICIALS—DEMONSTRATION PLOTS, CALABAR PROVINCE, 1949

Division	*No. 1 Level*	*No. 2 Level*	*Average of 2 Nil Plots*	*Value of Yams per cwt. Harvested*	*Value of increased Yield No. 1 Level*	*Value of increased Yield No. 2 Level*
				s d	s d	s d
Calabar	5,440	6,592	4,260	14 0	147 6	291 6
Abak	5,080	5,500	2,350	12 6	304 7	351 9
Uyo	3,390	3,380	2,090	14 6	168 4	166 4
Opobo	2,880	6,140	2,680	12 6	22 4	386 5
Arochuku	4,976	6,040	1,304	6 10	224 0	288 9
Oron	1,080	1,220	400	10 6	63 9	76 2
Ikot Ekpene	4,600	4,180	550	11 2	403 9	361 7
Average Yield per acre ..	3,921	4,722	1,948	11 8½	190 7½	274 8

Division	*Cost of Artificials No. 1*	*Cost of Artificials No. 2*	*Increased Profit No. 1 Level/acre*	*Increased Profit No. 2 Level / acre*
	s	s	s d	s d
Calabar	83	166	64 6	125 6
Abak	83	166	221 7	185 9
Uyo	83	166	85 4	0 4
Opobo	83	166	60 8 loss	220 5
Arochuku	83	166	141 0	122 9
Oron	83	166	19 3 loss	89 10 loss
Ikot Ekpene	83	166	320 9	195 7
Average Yield per acre	83	166	107 5½	108 8

The interest shown by farmers has been most gratifying and plans have been made for the carrying out of a large number of demonstrations in the coming seasons. If adequate supplies of fertilisers can be made available at an economic price to the farmer, there are reasonable grounds to expect that the practice of manuring with artificials will be widely adopted with far reaching effects on the fertility and agricultural productivity of this area.

10. *Lime.*—The scope of liming demonstrations was increased, a total of 325 farmers' plots compared with eighty-seven in 1947 being treated with lime locally produced at Awgu. The provincial distribution of these demonstrations was as follows :—

Onitsha	101
Owerri/Rivers	100
Ogoja	21
Calabar	113

The response to lime proved variable and was seemingly not proportional to the pH of the soil. Some plots presented a great contrast between limed and unlimed portions both with yams and cocoyams, as much as 80 per cent increase in yield being recorded, but it was noted that there was no response in a number of cases on very acid soils where spectacular results might have been expected. In a number of demonstrations on the poorest soils, interplanted maize gave appreciable yields on the limed plots whereas on those receiving no lime the crop was a complete failure.

There is no doubt that farmers have begun to appreciate the value of lime, but it is felt that the more spectacular responses obtained with artificials will make it necessary to combine liming with artificial manuring ; later omitting lime from the mixtures for land which has already received an application.

Machinery for grinding limestone has been ordered, but has not yet arrived.

11. *Organic Manures and Improved Shrub Fallows.*—Information continues to accumulate on the value of organic manures and planted shrub fallows in maintaining fertility. It can now be said that on the acid soils farm yard manure and compost, while being an excellent means of improving yields, are not sufficient in themselves unless applied in uneconomically heavy dressings at frequent intervals, of maintaining fertility under continuous cropping. These remarks do not apply to Bamenda where conditions are entirely different. Here it has been proved that with continuous rotational cropping, fertility can be maintained at a high level with annual dressings of 4 tons per acre of farm yard manure.

In order to maintain fertility with organic manures applied at economic rates, it seems that they must be used in conjunction with a fallow. The best shrub fallow so far discovered is *Acioa barteri*, and there is no doubt that where natural bush fallows are deteriorating this shrub is in itself capable of raising productivity considerably. Long-term experiments are in progress to determine the optimum lengths of fallow, and experiments combining the use of this fallow with varying applications of organic manures to the rotational crops have been devised. Every effort has been made to encourage the farming community to extend the use of improved shrub fallows and to adopt methods for the conservation and use on the land of refuse of all kinds, but so far with negligible result.

12. *Soil Conservation.*—The scale of work at the Agulu Soil Conservation Centre was considerably reduced and no wholesale treatment of badly eroded and gullied areas was undertaken. This has given the Development Officer-in-Charge more time to devote to propaganda work than was possible previously, and one or two villages have undertaken quite extensive reclamation work under his guidance. Experiments in land reclamation continued. Acioa gives promise of producing the most effective cover on these poor acid soils. Cashew also maintained vigorous growth, but Gmelina which promised well in the early stages has failed to come up to expectations. Measurements of rate of gully advance have been done on six treated and untreated gullies and

there are indications that the treatments applied—damming, planting the gully bottom and stopping water entering the gully by ridging and wave-bedding—have been effective in slowing down the rate of advance.

Propaganda on soil conservation measures has been widely carried out and a pamphlet on the subject has been issued. Responsible members of the community profess great interest and concern, but it is unfortunately true that there has been little or no progress in persuading the people to adopt improved measures. For example, the attempt to get the people themselves to undertake planned reclamation of an area of poor and eroded land at Isuochi in Okigwi Division has reached an impasse. The people have flatly refused to try to follow out the advice of the Department, and have stated quite plainly that they wished to have nothing to do with any scheme of improving their land. In the light of this attitude it became impossible to enforce the Farming Rules drawn up by the Isuochi Clan Council in 1946 and the scheme has had to be dropped for the time being.

On departmental farms, experiments are in progress to determine the most satisfactory soil conservation measures for the districts they serve. A beginning has been made with the introduction of strip cropping and an endeavour made to carry out demonstrations on farmers' lands, but it is feared that no real progress will be achieved until there is a radical change of attitude among the farming community and existing systems of land tenure are revised, when it may be possible to fix responsibility for the care of the land.

OIL PALM INDUSTRY

13. *Production and Export.*—The season has been a successful one for the oil palm and it is gratifying to be able to report that purchases of palm oil and kernels for export during the calendar year were the largest for many years, grading figures being 141,220 tons for palm oil and 185,539 tons for kernels. For comparison, grading figures for the previous three years are as follows :—

	Palm Oil (*tons*)	*Palm Kernels* (*tons*)
1945	99,900	153,448
1946	102,079	142,564
1947	130,966	164,095

In addition to enhanced yields due to a favourable season, the increased prices for palm products announced early in the year no doubt also encouraged more complete harvesting and it is probable also that some oil was diverted from local internal to the export market.

Figures for railings of palm oil to the Northern Provinces were 9,372 tons compared with 9,543 tons railed during 1947.

14. *Oil Palm Cultivation.*—In view of soil fertility problems and the shortage of improved seedlings, active propaganda to encourage palm planting remained in abeyance. Experience has shown that owing to the limits to the advantages of cultivated palms imposed by soil fertility difficulties, it is essential to maintain a very high standard of improvement in respect of oil palm planting material. Though everything possible is being done to increase supplies, the needs of large scale projects such as the Bamenda-Cross River-Calabar Scheme, to which priority has been given, resulted in an insufficiency of improved seedlings to meet the demands of farmers which have much increased as a result of the higher prices being paid for palm products. Now that the needs of the

Bamenda-Cross River-Calabar Scheme have been satisfied, there will be considerably more seedlings available for farmers from 1950 onwards. During the year under review, 8,035 improved seedlings were purchased by planters representing approximately 134 acres, while a further 37 acres were planted up with bush seedlings. Many farmers, however, expressed their intention of waiting for improved seedlings rather than have recourse to planting bush seedlings.

15. *Oil Palm Research.*—Oil Palm Research is catered for by the Oil Palm Research Station, Benin, which also exercises general supervision over local activities of Agricultural Officers. Details of the latter are contained in the annual report of this station which is issued separately, and a brief account is included in the report on the Specialist sections of the Department.

16. *Oil Palm Machinery.*—The already keen demand for palm oil presses was given added impetus by the increased prices for palm oil announced early in the year. Unfortunately the supply position still remained unsatisfactory despite the efforts of the importing firm to obtain additional supplies and the demand considerably exceeded supply. The total number of presses in operation at the end of 1948 was reported to be 1,185 compared with 860 in 1947. This figure excludes 146 out of operation awaiting repairs and spare parts. Supplies of spares remained difficult despite every effort to ameliorate the position.

Assistance was again provided by the Department in the selection of sites for Pioneer Oil Mills. Details of these projects which come under the control of the Department of Commerce and Industries are outside the scope of this report.

17. *Oil Palm Survey.*—In order to plan both for oil palm research and for the introduction of improvements, it was considered essential to have thorough and detailed information regarding the present position in natural groves and all aspects of the oil palm industry as it now exists. At the beginning of the year a start was made towards obtaining the knowledge we lack, and a detailed survey is being undertaken in an area of about 10 square miles of typical thick " palm bush " selected near Nung Udoe in Uyo Division. A comprehensive questionnaire framed in co-operation with officers of the Oil Palm Research Station has been drawn up and a mass of information is being accumulated for tabulation. By the end of the year eighty-four one-acre plots, scattered throughout the area, had been demarcated for the survey.

OTHER CROPS

18. *Cocoa.*—A survey of the cocoa areas in the Cameroons was completed in the course of the year and revealed that there was a total acreage of 56,474, of which 48,915 acres are privately owned, and 7,559 acres operated by the Cameroons Development Corporation. A survey of cocoa in Ogoja Province was also completed and revealed a total of 1,667 acres under private ownership.

The Cameroons survey has shown that much of the cocoa is of an inferior type and that the majority of farms are badly neglected. There is thus much that can be done to improve the industry. Shortage of Senior Service staff has so far prevented the posting of an Officer to Kumba, but an officer will be posted there as soon as one is available. His main duties will be to improve the standard of cultivation in the local farms, and to implement the recommendations made in the Report submitted by the Principal Research Officer, West African Cocoa Research Institute, after his tour of the Cameroons in 1947. Exports of cocoa from the Eastern Provinces and Cameroons amounted to 2,544 tons compared with 2,577 tons in 1947.

Rice.—There has again been a most satisfactory expansion of rice cultivation in the Ogoja and Onitsha Provinces, and it is estimated that there are now 9,000 acres in each of the two provinces. This is double the 1947 acreage in Ogoja and is 2,000 acres up on the 1947 figure for Onitsha. Yields in Onitsha were reported to have been average, but in Ogoja irregular rainfall had an adverse effect on yields, which were appreciably below normal.

Experimental plantings of rice were undertaken in the Massagha Swamp (Bamenda-Cross River-Calabar Scheme) and yields up to 1,900 lb of paddy per acre were obtained. It is thought that a considerable area of this swamp would be suitable for rice and it is aimed to plant up 60 acres in 1949. In the Owerri and Calabar Provinces interest in swamp rice cultivation as in the past was negligible.

The small rice mill at Otuocha continued to prove popular and was quite unable to cope with the quantity of paddy brought in for hulling. Unfortunately the engine crankshaft broke in December and milling operations ceased. Arrangements were made to replace the engine with a new one. A second mill was opened at Okphoha in the Abakaliki Division in November and has been well patronised, working eight hours a day. A third mill has been set up at Abakaliki and will be in operation early in 1949.

Fruit.—Budding of citrus and other fruits was carried out at Departmental and Native Administration nurseries. The demand among Africans is mainly for oranges, but tangerines are gaining popularity. Total sales were 7,956 citrus, 2,570 kola and 1,671 miscellaneous fruit trees including budded mangoes.

Cinchona.—Work on Cinchona at Bamenda and Esosong was confined to the maintenance of the small observation plots of superior varieties and strains for the provision of information which might be required in the future.

Linseed.—Seventeen small trial plots of linseed were laid down in widely separated sites in Bamenda Division to obtain further information on yields before considering its introduction to farmers as an export crop. Yield figures are not yet available, but it seems certain that this crop will have a restricted application as it is clear that it will only produce satisfactory yields in extremely fertile soils.

Coffee.—A survey of existing Arabica Coffee in the Bamenda Division revealed a total of 593 acres, excluding 1948 plantings. Selection work was started at Bambui on Arabica planted in 1946 which had recently come into bearing.

Tetracarpidium Conophorum.—Investigations into the establishment and cultural requirements of *tetracarpidium* were continued. Observations to-date indicate that for successful establishment, germinated seed or seedlings are preferable to seed planted *in situ*, and that both shade and a good soil with a high organic content are necessary. Information is not yet available on such problems as optimum spacing and shade requirements, and whether manuring with organic or artificials is economically sound. These points are being investigated.

19. *Botanical Work.*—An account of botanical work on cassava, cocoa and other crops is included in the report on the Specialist sections of the Department.

MISCELLANEOUS

20. *Settlement Schemes.*—The Department has continued to interest itself and assist in the Bamenda-Cross River Settlement Scheme with staff, advice and planting materials.

(*a*) *Palm Planting.*—Improved seedlings supplied to-date were as follows:—

	Planting Target	*Seedlings supplied*
1947..	140 acres	24,000 in 1946
1948..	400 acres	28,000 in 1947
1949..	515 acres	50,456 in 1948

Mortality among seedlings planted in the nursery during 1948 amounted to 12.6 per cent due chiefly to nursery wilt disease. Surviving seedlings at the end of the year totalled 46,762 so that there is a sufficiency of seedlings for planting up the 1949 target and for supplying vacancies.

(*b*) *Mile* 25 *Settlers.*—Each of the eleven settlers has now been allocated 5 acres of palms in the 55 acre blocks planted up near the settlement, but the standard of maintenance leaves much to be desired and much supplying is required. The first year's cropping on the individual farm holdings produced very satisfactory yields. Acioa is being established through the first year rotational area.

Efforts have been made to persuade the settlers to employ improved cultural practices with particular emphasis on contour cultivation and composting, but this group of settlers lack interest and initiative and are not of the type desirable for such a venture.

(*c*) *Mile* 30 *Kwa Falls Settlement.*—By the end of the year approximately fifty holdings of 10 acres each had been demarcated and settlers were being selected. Farming in the first year will take place through the palm block and not in the holdings.

(*d*) *General.*—A small poultry unit run by the Department has been set up at mile 30, and plans have been made for the establishment of a nursery capable of providing the needs of the settlers in respect of citrus and other fruit trees.

21. *Training of Ex-servicemen.*—Six ex-servicemen were set up as Unit Farmers-in-training at Bambui Farm and a similar number at each of our farms at Nkwelle and Umudike are undergoing training in general practice in pig-keeping, poultry and vegetable gardening.

22. *Agricultural Machinery.*—Two tractors have been ordered and will be tested at Abakaliki which will become the centre for testing Agricultural Machinery and for the training of operators.

FRANCIS E. BUCKLEY,
Acting Deputy Director of Agriculture,
Eastern Provinces

IV. Agricultural Staff Training Schools: Annual Report, 1948

COURSES

As in previous years, the Departmental School at Ibadan has continued to train Assistant Agricultural Officers and Agricultural Assistants, while that at Samaru continued to train Agricultural Assistants including a few Native Administration Assistants.

2. At Ibadan, the reorganisation of Assistant Agricultural Officer training, consequent upon the absorption of the Higher College by the University, was completed during the year. All present trainees in this course are outstanding Agricultural Assistants who have had at least one year of training as such. The training course for Assistant Agricultural Officers is a three-year one and is designed as a continuation of the first year of Agricultural Assistant training, so that it is in effect, a four-year course. Tours of instruction to Agricultural stations in all three Regions, and individual research problems form important aspects of the course. It is considered essential to maintain a standard at least as high as the former Higher College Diploma. To this end four members of the 1948 Class who failed to reach this standard, were withdrawn from the course and reverted to Agricultural Assistant's duties.

3. In 1947 the Ibadan three-year course for Middle Six boys was reduced to two years in order to permit commencement of the Assistant Agricultural Officer's Course referred to above. This reduction has necessitated considerable revision and condensation of the course and much of the basic and applied science teaching has had to be cut out in order to permit adequate teaching of the more strictly Agricultural subjects of Crops and Stock Husbandry.

4. At Samaru School in order to meet the needs of Agricultural Officers and the wishes of the Administration every effort was made to recruit more Northerners. Twelve Northerners were admitted into the 1948 Course and thirty have been selected for the 1949 Course. This policy has necessitated a reduction in standard of entry from Middle Six to Middle Four and in view of this the Samaru Agricultural Assistants Course now consists of three years in the School instead of two in the School and one in the field, as formerly.

JUNIOR SERVICE STAFF IN TRAINING

5. At the beginning of the year there were eighteen Junior staff in Assistant Agricultural Officer's Courses and 109 in Agricultural Assistant's Courses. At the end of the year nineteen and forty-six respectively were available for 1949 Classes and thirty-three Agricultural Assistants having completed their training, were available for posting. No Assistant Agricultural Officers became available for posting. All trainees were Nigerians.

FARMS

6. The school farm at Ibadan is now virtually independent of Moor Plantation for teaching material, a dairy, piggery, second farm store and poultry unit having been established. Moor Plantation has continued to assist by providing additional land for training in experimental work. Farm buildings at Samaru have been improved and added to, and a poultry unit and dry season vegetable garden were established.

D. H. Welch,
Principal

V. Oil Palm Research Station

I.—ADMINISTRATION AND DEVELOPMENT

The development of the Station is being continued as fast as circumstances permit and much time is taken up in dealing with the administrative questions involved.

Finance

2. The work of the station is financed from both United Kingdom Colonial Development and Welfare Funds and from Nigerian Development Funds. Votes totalling £70,380 under the former and £13,920 under the latter were allocated.

Staff

3. A substantive appointment was made to the post of Officer-in-Charge. A Senior Botanist and two Botanists were seconded from the Agricultural Department and functioned as pathologist, agronomist and plant breeder respectively; each of these officers was on leave for varying periods, without relief. The post of Chemist remained vacant. A Development Officer was seconded from the Administrative Auxiliary service to act in the post of Station Manager.

4. Junior Service staff totalled fifty-seven by the end of the year. The labour force at the main station averaged nearly 700 men.

Construction Programme

5. Good progress was made in the construction of the numerous buildings required, but the programme is some twelve to eighteen months in arrears. Two houses for Senior Service staff were almost completed and two others were under construction. Twenty-four D-type quarters for Junior Service staff were completed. Most of the staff are still inadequately housed, but the building of quarters of all types receives high priority.

6. The administrative offices were completed, and the pathology laboratory was almost ready by the end of the year. A chemistry laboratory is under construction.

7. The temporary water supply gave satisfactory service for most of the time, but the pumps, which are very old, began to give trouble at the beginning of the dry season. This seriously hindered the work of the station and, in particular, the watering of the nursery.

8. Plant and materials for the electricity supply have been ordered.

Planting

9. A further 70 acres of palms were planted, bringing the total planted area up to 675 acres. During the last three years planting has been very successful, losses amounting to no more than 2 or 3 per cent. This must be largely attributed to planting with a " ball of earth " which has only been made possible by lorry transport.

Sub-Station

10. Negotiations have been in progress for the acquisition of a small area of land in the Abak Division of Calabar Province to serve as a central Sub-station at which important cultural experiments and progeny trials would be carried out under the conditions of the main palm belt. The negotiations were almost completed by the end of the year. The total area of the station is likely to be about 400 acres, of which about half will be good natural palm grove.

II.—RESEARCH

Agronomy Division

11. *Establishment of Oil Palms.*—The average germination for the year was 45 per cent after four months. This was satisfactory, but as usual the results from individual samples were very irregular. In 1947 it had been found that regular watering in the nursery gave some control over the nursery wilt disease, the total losses in that year being only 12 per cent. Because of this a start was made to water the 1948 nursery throughout the dry season at the rate of 1 gallon per seedling per week, but owing to breakdowns in the pumping plant this programme could not be adhered to. A summary of seed sown and seedlings transplanted is given below :—

	Sown 1948	*Transplanted* 1948 (*Sown* 1947)
(*i*) Selfed *dura ex* Calabar ..	2,420	3,348
(*ii*) Selfed *dura ex* Ogba	24,911	2,812
(*iii*) Extension Work Seed	21,113	5,337
(*iv*) Miscellaneous	48,260	27,809
Total	96,704	39,306

Groups (*i*) and (*ii*) are for use in cultural experiments, and the former also as a standard in yield trials. Group (*iii*) is for testing the yielding ability of extension work seed, and group (*iv*) is for experiments on nursery and transplanting technique.

12. *Experimental Work at O.P.R.S.*—Cultural experiments already in progress were continued. Four new experiments started were :—

(*a*) A *Nursery experiment* which includes various combinations of shading and watering in an attempt to find the most economical and satisfactory technique in the nursery.

(*b*) An *Anti-pest experiment* to determine practical measures of protecting newly-transplanted oil palm seedlings from the " cutting grass " and other pests. This experiment has already shown that painting the base of the seedling with tar, so far from deterring the pests, actually attracts them.

(*c*) A *Fertilizer experiment* to test factorial combinations of organic and inorganic manures at different rates. The fertilizers will be applied to young palms. Half of the 100 acres for the experiment was planted with selfed *dura* palms, the most uniform material for the purpose. The remaining area will be planted in 1949.

(*d*) A *Soil Covers experiment* to test the effect of various covers on soil fertility. Of the nine covers used most were local plants. A previous experiment similar to this, which had been planted in 1943, was felled during 1948, and will be test-cropped with maize in 1949.

13. *Outstations.*—Only the formal acquisition notice is awaited for the 400 acres of land near Abak in Calabar Province which will be the new Oil Palm Research Sub-station. Thanks to the co-operation of the owner of part of the area it has been possible to record during the year the individual palm yields of 120 acres of natural grove. This grove is typical of that found in the main palm belt and a close study of it should provide most valuable information on yields, disease incidence, regeneration, and other matters.

14. Individual palm yield recording was continued on the nine farmers' plots which were taken over on a ten-year lease in 1945. We now have four years of such yields and these will be most valuable as uniformity data for use in interpreting the results of the new experiments which it is planned to start on these plots in 1949.

15. A new fertilizer experiment was started at Umudike on twenty-year-old palms, and consisted of an eighty-one-plot confounded factorial experiment with N.P.K. and lime, each at three levels. Fertilizers were applied at the end of the rains, and it is hoped that it may be possible to detect an initial response in 1949.

16. Close contact has been maintained with the oil palm survey which has been initiated on a small scale in the Nung Udoe district of Uyo Division of Calabar Province. In an area of about 12 square miles some eighty sample plots of one acre each are being studied. The plots contain natural palm grove of various types, and information on yields, disease incidence, regeneration, etc., is being obtained. The survey is expected to provide data of the greatest value to the research programme.

Plant Breeding Division

17. The only planting during the year was with extension work seed; 6 acres were planted for testing genetic segregation and 12 acres for testing yield. Planting finished in June and losses were only 0.3 per cent by the end of the year, a very satisfactory beginning.

18. *Improved Seed for Farmers.*—This seed, referred to elsewhere as extension work seed, is obtained from palms selected for good yield and superior fruit composition, and the total number produced at various stations in 1948 is shown in the following table:—

	Ogba	*Nkwelle*	*Umuahia*	*Total*
dura x *dura*	169,417	31,926	37,613	238,956
dura x *tenera* ..	—	28,797	33,538	62,335
tenera x *dura* ..	123,185	—	—	123,185
dura x *pisifera* ..	120,368	29,213	26,337	175,918
Total	412,970	89,936	97,488	600,394

Compared with 1947 there is a general increase, but the main increase is at Ogba where the number of selected seed trees was increased from 158 to 322; this, and the use of the ninety-seven selected *tenera* palms as seed trees instead of merely as pollen-producing trees, has almost doubled the quantity of seed from this station. Allowing for losses in germination and in the nursery the seed produced in 1948 should give enough seedlings to establish nearly 3,000 acres of plantation in 1950 and 1951.

19. Twenty-four palms have now been selected at Ibadan and are being used to produce seed for planting in drier areas.

20. A total of 400,000 selected seed was supplied in response to a number of requests from outside Nigeria (United States of America, Anglo-Egyptian Sudan, Gold Coast, Zanzibar), but the amount of specially pollinated seed which can be spared for such purposes is at present small.

21. *Fruit and Bunch Analysis.*—The question of the weight of sample necessary to get an accurate estimate was investigated in detail, and it was found that the sample may be reduced from the present weight of 4 lb to 1 Kg. without impairing the usefulness

of the method for selection purposes. At the same time it was shown that the composition of fruit from a palm fluctuates throughout the year. A correlation with the rainfall nine months previously was found, and this will need further investigation.

22. *Breeding Programme.*—A scheme for the new breeding programme was drawn up and the work begun. This programme aims at elucidating the genetic relationship of the various types and forms of oil palms and in connection with it seven outstanding wild palms in the thin-shelled palm grove at Ufuma were selected. Work on the *dura* x *pisifera* cross was also started. Seeds of six kinds of oil palms and eight species of palms were received and sown in the germinator for ultimate planting in the palmetum.

23. *Station Yields.*—The approximate average yields for the station grouped according to year of planting are as below :—

	Yield per acre (approx.)	
	No. of Bunches	*Weight of Bunches*
1939	326	7,421 lbs.
1940	401	6,444
1941	346	4,299

Plant Pathology Division

24. A preliminary survey of oil palm diseases in native palmeries and in European plantations was carried out in the Southern Provinces of Nigeria and in the Cameroons from mid-January to mid-April. The general health of palms in the native palm groves, which supply the bulk of the industry, was found to be good. In marked contrast was the incidence of leaf blights, crown diseases, root and trunk rots, and wilts found in both nursery and field in plantations.

25. The chief cause for unthriftiness appeared to be non-parasitic and due to deficiencies in supply of water or nutrients in the soil. Potash deficiency has already been recognised.

26. Second in importance is the incidence of the fungus *Ganoderma lucidum* (Leys.) Karst., which was found causing a basal decay of juvenile palms (aged three to five years) in plantations, and a trunk rot of senescent palms (thirty to forty years) in plantations and native palmeries. In some areas this disease is causing anxiety to the habitants. Professor Wardlaw's Wilt Disease (*Fusarium oxysporum* Fr. forma *elaeidis*) was found on two plantations at Sapele and Calabar. At the latter station, *Penicillium wortmanni* (Klocker) was found associated with the Fusarium in the necrotic vascular bundles. Fusarium Wilt has not yet been recorded from native palmeries in Nigeria but a close watch is being maintained as the disease constitutes a serious potential threat to the industry.

Chemistry Division

27. In the absence of a Chemist the work of this Division has been very largely confined to the conduct of fertilizer and fallows experiments on annual crops designed by the Department's Chemists at Ibadan. These experiments represent fundamental studies on the maintenance of fertility on the acid sands soil type and are, of course, of the greatest interest to O.P.R.S. even though they are carried out on annual crops. The fertilizer experiment is an eighty-one-plot experiment on N.P.K. and lime ; the second crop (cassava) has now been harvested. The fallows experiment aims at testing two, three and four-year *Acioa* fallows in comparison with a bush fallow ; this experiment is also in its second year.

F. W. Toovey,
Officer-in-Charge

VI. Report of the Botanical Section, Ibadan

GENERAL

The botanist at Ibadan continued to be responsible for botanical work on agricultural crops throughout the Western and Eastern Provinces and continued as best he could to supervise the several lines of work which are here described. Towards the end of the year the position improved with the posting of a second botanist to the area, and this permitted some of the past work on food crops to be summed up and plans for future work to be formulated.

2. *Weather.*—The rainfall in the Ibadan area was less than that recorded in any year since readings started in 1910 and this had its serious effect on the crops and on the progress of work on them. By the end of the year the permanent crops were suffering severely from drought. The total rainfall at 32.9 inches compares with an average of 45.7 for the previous ten years. The distribution is shown in the following table, from which the unusual dryness of July and August will be noted.

RAINFALL AT MOOR PLANTATION IN 1948 AND MEAN OF TEN PREVIOUS YEARS

	Rainfall in inches	
		Mean for ten years
Month	1948	1938-47
January	—	0.49
February	0.91	0.70
March	3.05	2.72
April	8.44	5.37
May	2.99	6.23
June	3.61	5.94
July	1.88	4.78
August	0.71	3.78
September	4.95	7.52
October	4.80	6.22
November	1.53	1.69
December	—	0.25
Total	32.87	45.69

COCOA

3. The main work on cocoa was the propagation of the local selection T38 which is being planted in clonal plots at selected places throughout the cocoa area in order to provide sources of improved seed for farmers. While propagation of cuttings has been continued, reliance is being placed for the most part on budding to multiply the clonal material. At Moor Plantation, one acre of rooted cuttings was planted and at the INA Cocoa Farm three acres of budded plants and seven acres of seedlings for later buddings. The drought affected these new plantings severely and it is anticipated that two-thirds will require to be re-planted. Land was prepared for planting at Ondo, Ife, and Ilesha, and as the seedlings in these places were started in nurseries and kept watered, progress here was not seriously retarded.

4. Reports from the West African Cocoa Research Institute in the Gold Coast suggest that types introduced some years ago from South and Central America are likely to surpass in yield anything hitherto grown in West Africa. Since 1947, budwood of this collection, comprising fifty-six selections of cocoa, has been sent from Accra and has been grown on Nigerian rootstocks. The first of the budded plants were planted out in June and the remainder are to be planted in the rains of 1949.

5. Since one of the characters desired in these introductions is vigour, which may be modified by use of a rootstock of another variety, it has been decided to grow some of these introductions, particularly a type of yellow-pod cocoa from the Upper Amazon, as seedlings on their own roots. Six pods produced by selfing and received from Tafo in December, are fore-runners of a much larger supply to come.

6. *Agodi Cocoa Farm.*—The cocoa at Agodi, consisting of nearly 10 acres planted by farmers and later acquired by the Department, gave every prospect of a record yield. As the season advanced, however, production fell below expectations and in the end a yield of only 543 lb dry beans per acre was reached as against an average of 605 lb for the previous seven years.

7. *Owena Farm.*—The farm at Owena continued to suffer severely from capsid attack. A paint of Sanilac (a proprietary emulsion containing 25 per cent DDT) made by mixing one part emulsion with nine parts water, gave good control on small plants, but proved ineffective on larger trees where some of the branches could not properly be reached with the paint-brush.

8. *Observation Plots.*—A small start has been made with the observation plots which are managed in co-operation with Cocoa Survey, and first records have been obtained from several in Ondo Province and near Ife and Ilesha in Oyo Province. These consist of small areas of farmers' cocoa, either 1 acre or 2 acres in size, from which it is hoped to obtain accurate records of the yield from cocoa at different ages under differing conditions of soil and environment, and under various systems of maintenance. Early though it is to base any conclusions on these plots, two facts seem to be emerging. Firstly it appears that in farmers' plots the planting is much thicker and the yield per tree correspondingly less than we have assumed. The average number of trees per acre in Nigerian cocoa is commonly taken as 500, whereas in some of the plots (and at the Agodi Farm) 700 is nearer the mark for twenty-year old cocoa. Secondly the first year of records has suggested that, while farmers who harvest their crop only twice or three times in the season may suffer almost total loss from black-pod, the adjoining plots harvested by the Department at regular and frequent intervals may yield a good proportion of sound pods.

9. *Ibadan Native Administration Cocoa Farm.*—The main cocoa experimental farm twelve miles south of Ibadan suffered from the most severe attack of capsid in its history. By October the older plots looked as though they had been burned with fire, but fortunately the later plantings, in which the more significant work is being done, were hardly touched by the pest.

10. Interesting results were obtained from the progeny trial, a varietal trial planted in 1942 containing progeny of the self-pollinated Nigerian selection T38, progeny of five self-pollinated Trinidad selections, and progeny of three crosses between Trinidad selections and T38. Although a few pods have been obtained during the past two seasons, an appreciable yield was obtained this year for the first time. The greatest yield was not given by the Trinidad plants nor by the Nigerian selection but by the three crosses between the two.

11. The spacing-trial, also planted in 1942, in which the progress of cocoa planted at seven different spacings ranging from 5 feet by 5 feet to 15 feet by 15 feet is being recorded, gave a fair yield also. Although individual trees in the close and in the wide spacing have made similar growth yet the appearance of the plots is very different. The close-spaced plots have the appearance of a wood, with trees making a close canopy and a litter of leaves on ground free from weeds. In the wide spacing the plot is much more open and the ground covered with grass and weeds which have periodically to be cutlassed. As is to be expected in the early years of production the greatest yield per plot was obtained from the closest spacing (5′×5′). Less expectedly, the greatest yield per tree was also given by a close spacing (6′×7½′).

12. *Cameroons Cocoa.*—A visit was paid to the Eastern Provinces and Cameroons to advise on observation and experimental plots to be started there. Much of the farmers' cocoa seen in the Cameroons was in a poor state and unproductive, a condition which seemed attributable to bad management rather than to unsuitable soil or climate. In a typical planting, the land is clean-felled and seeds are planted at wide spacing (12′ or 15′), two seeds to a stake. All seedlings which grow are left, so that it is common to have two trees growing on the same site. The wide spacing induces a low-branching bushy habit. The heavy rainfall encourages tremendous under-growth, and cutlassing is commonly neglected, so that weed-growth reaches up to the lower branches of the trees. As a result there is no circulation of air and conditions are suitable for blackpod. In an attempt to control this, the farmer thins the foliage by cutting branches off his trees and prevents formation of a canopy in order to let in light and air. This in turn encourages growth of grass and deterioration of soil, resulting in gradual decline of the cocoa.

13. Cocoa in the Cameroons is particularly subject to *Phytophthora palmivora* which may indeed prove to be a factor limiting production. Damage might be reduced if a tall and high-branching habit were to be encouraged by planting seed closely, say at 5 foot spacing, by thinning surviving seedlings to one per stand, and by gradual thinning of the young trees to a final spacing of 15 feet. Frequent cutlassing should be done to check undergrowth and so to reduce humidity and allow movement of air under the canopy. It was recommended that observation plots of growing cocoa and new plantings be started at suitable sites in order to put these methods to the test.

14. In Ikom Division of Ogoja Province, the growing of cocoa is being taken up enthusiastically by the people. The land over an area of 100 square miles seems well suited. Cocoa-growing is said to hvae been started in this district by two strangers from Liberia or the Gold Coast, and later planters appear to have imitated their methods. Two or three seeds are planted at stake, and are allowed to grow without thinning, the stands are at wide spacing, and there is heavy growth of grass and bush which remains insufficiently cut. The planting material is very mixed and much of it is poor. Here again, there is a need for departmental plots in which better maintenance will be demonstrated, and seed of better cocoa produced for the use of farmers. The experimental planting at Bateriko fifty miles to the north-east of Ikom has made a promising start and it seems likely that, when the area between these two places is opened up, a wider area suitable for cocoa may be found.

15. *Swollen Shoot.*—The collection of virus strains from Nigerian cocoa was maintained in the insect-proof houses, and additions were made as new strains were found. During the year an outbreak was visited at Alaparun, near Moniya, about twenty miles from Ibadan. Although within fifteen miles of other outbreaks, this

showed peculiar features in that no swellings were found in the shoots and the mosaic pattern in the leaves was distinctive.

OTHER CROPS

16. *Kola.*—The main trade in kola is in the introduced type Gbanja (*Cola nitida*) which is grown mainly in the Colony and Abeokuta Province but also to some extent throughout the Western Provinces. In the Ife district, however, there are extensive plantings of Abata kola (*C. acuminata*), the species which is native of the forest belt of Nigeria, and for which there is a specialised market in the south, and in the middle belt. This species has been of challenging interest to botanists at Ibadan since a two-acre plot planted at Moor Plantation failed to produce fruit for years. In 1947, however, one tree produced a fruit and in 1948 eight trees gave a small number of pods. These pods had not the typical appearance of true Abata kola and there seems a possibility that the trees are of hybrid origin.

17. Enquiries made at Ife from a successful kola-farmer there showed that farmers recognise some Abata kola-trees as being productive at an early age and others as being sterile or at least tardy in bearing. Seed from the shy bearers is understood to give unproductive trees and the best farmers are careful to raise seedlings from picked trees producing many large pods. Seeds and cuttings were obtained from selected trees in order to make a further trial of this species.

18. The propagation of both kinds of kola by stem cuttings has been tried but with only moderate success, 19 per cent of the cuttings being successfully rooted, and some improvement in the technique seems desirable.

19. *Coffee.*—Increasing interest is being taken by farmers in the growing of coffee. Plots for the supply of robusta seed are maintained at Nkwele and Ina. The two types of robusta which have given best results so far are from Javan seed and it appears now that further selection amongst the progeny might profitably be done.

20. *Citrus.*—Records of the grapefruit rootstock trial planted at Moor Plantation in 1932 were brought up to date and the yields from the start of bearing to December, 1948, were analysed. This experiment was made up of six blocks containing seven trees each. Each of the six blocks contained grapefruit budded on seven rootstocks, sour orange, acid lime, grapefruit, sweet orange, tangerine, rough lemon, and shaddock, the arrangement of the seven trees in the block being randomised. The shaddock and rough lemon rootstocks proved a failure, and it seems evident that the type of lemon used was lacking in vigour. The tangerine also was omitted from analysis since it appears that through shortage of material two different varieties of tangerine were used in the trial. Of the four remaining rootstocks sour orange gave a higher yield than acid lime at a 5 per cent level of significance and than grapefruit and sweet orange at a 1 per cent level. The trees on sour orange have made a noticeably vigorous growth and give uniform fruit. There seems every reason for recommending the continued use of sour orange as the rootstock for grapefruit in the Western Provinces.

21. The corresponding trial in which sweet orange was used as the scion has yet to be analysed from the start of fruiting up to the present time. In most years the greatest yield has been given by the trees on sour orange stock but in 1948 those on tangerine proved the most productive.

22. *Cassava.*—In a yield trial of cassava at Ibadan planted in May, 1947, in which six of the botanist's hybrids were compared with a Gold Coast hybrid and two local varieties, the Gold Coast hybrid GC997B gave the highest yield, heading the list for the third year in succession. The only variety to approach it in yield was the hybrid C36/33, and this was shown to have such poor eating properties as to be not worth growing. GC997B itself was only regarded as fair in quality by the local cooks who tested its suitability for " gari " and " foofoo ". This is the first occasion on which tests of quality have accompanied the cassava yield trial, and it is obviously of importance that in assessing the value of a variety its quality be taken into consideration as well as its bulk.

23. Yield-trials involving additional varieties were laid down both at Ibadan and Umuahia in April, 1948. At both stations an attempt was made to grow a plot of cassava free from mosaic in order to provide clean planting-material. A weekly inspection was made at which any plants showing virus symptoms were pulled out. The gaps thus made were filled by planting cuttings from adjoining clean plants. At both places the greatest difficulty was experienced in getting rid of all plants carrying infection and six months after planting a few plants were still being pulled out at each inspection.

24. *Leguminous Crops.*—A collection of leguminous food-crops including several varieties of cowpea and soyabean has been made at Umuahia with the object of finding varieties suited to the needs of the Eastern Provinces.

25. *Cotton.*—Work on this crop is restricted to the maintenance of the selected Ishan " A " type of barbadense cotton and its multiplication for one year on the Botanist's Plot. After this it is multiplied for a second year on Moor Plantation and for two years in the isolated Meko district of Abeokuta Province before general distribution to farmers. The scheme has been interrupted in recent years through failure of the cotton on Moor Plantation as a result of attack by *Helopeltis sanguineus.* Following suggestions made by Messrs J. B. Hutchinson and E. O. Pearson, attempts were made to avoid damage by this pest in three ways, by protection with a spray containing DDT, by inter-planting with another crop in accordance with local farmers' practice, and by growing in isolated plots in forest areas.

26. The use of DDT (5 per cent wettable DDT applied as a spray) gave striking results. The point in each row where spraying stopped and plants were left unsprayed was easily marked by the change from bushy spreading plants to crippled and dwarfed plants. The crop obtained from the sprayed plot was not large but this may be attributed to poverty of the land rather than to capsid attack, and on the strength of this year's results it would appear that cotton can still be grown on the Plantation on land in good heart if protected by DDT. The planting of cotton amongst growing maize proved a failure since under the exceptionally dry conditions which prevailed the cotton made too slow a start and had reached little size before it commenced to flower.

27. The isolated plots at Ife, Ijebu Ode, Otta, and Ina were all successful. Planted on land newly cleared from bush the cotton made excellent growth and suffered no damage from *Helopeltis.* At the Abeokuta Native Administration Farm Centre growth was only moderate and capsid damage was rather heavy.

28. *Tobacco.*—Tobacco varieties grown in Nigeria fall into two main groups. There are the named imported varieties whose growing in selected areas is organised for the supply of the cigarette factory, and there is the so-called " native " tobacco

grown in every province and nearly every village for the supply of the local market and to fill the farmers' pipe and snuff-box. The origin of this tobacco is not known but judging by its wide distribution it has been in the country for many years. Samples of tobacco as prepared by the farmer were collected from many parts of Nigeria and were sent to the Imperial Institute for expert opinion. It was found that some of the samples, and in particular several from the "middle belt" (the wood-land savanna country) were of reasonable quality and might find a market outside Nigeria. Late in the year, arrangements were made to prepare larger samples and also to grow seed collected from different districts in observation plots to see what variations occur in this type of tobacco.

29. In the tobacco grown from imported seed for the British American Tobacco Company at Ago Are in Oyo Province there was a serious epidemic of leaf-curl which greatly reduced the crop. Although the seed-beds had been cleared at the time the place was visited, the indications were that infection had started in the central nurseries and had thus been carried amongst the seedlings to the farmers' plots. A search in the neighbourhood of the nurseries failed to reveal any old tobacco which might have carried the virus over from the previous year and presumably it must have perennated on some alternative host. Little is known about the hosts of this virus and some work on this problem is needed. Advice was given, with the assistance of the Entomologist, on steps to be taken to keep the seed-beds clean next year and to prevent the white-fly which spreads the disease from increasing in the beds. White-fly on tobacco was extremely abundant during the year and was seen as late as mid-December on infected tobacco on Moor Plantation.

30. *Mucuna.*—In 1934 West recorded a disease, which he presumed to be due to virus, on *Mucuna aterrima* commonly grown as a cover-crop on our experimental farms. This disease seems to be on the increase at Moor Plantation. It has now been proved to be caused by a virus readily transmitted by mechanical inoculation. Spread in the field is rapid.

31. *Tetracarpidium.*—In view of the attempts being made to bring this plant into cultivation as a source of vegetable oil, tests were made to see if it could readily be propagated by vegetative means. Terminal cuttings of green shoots, thin woody cuttings, portions of thicker woody stems, and root cuttings were tried without success.

32. Numerous requests for planting material from overseas were handled by the Botany Section, and the collection, treatment, and transmission of this material took up much time. Introductions of plant material passed through the Section in order that records could be kept and that inspection might be made for pests or diseases accompanying the material. Many requests for information were dealt with, and a start was made with a herbarium to contain the varieties of plants of economic use in the Southern Provinces.

T. A. Russell,
Senior Botanist

Botanical Section—Zaria

The various lines of work previously reported have been continued, and one or two new lines have been started.

COTTON

The routine maintenance of strain 26C has been continued, but in addition a programme of reselection within this strain has been initiated. Strains introduced from East Africa have been multiplied and tested in a variety trial, and one of these gave very promising yields. It is hoped that these varieties will provide breeding material for further improvement on 26C.

3. *Season, Pests and Diseases.*—Early cessation of rains at Samaru, and a low total rainfall (9 inches below average) adversely affected the growth of cotton. Pink bollworm was less prevalent than the previous year. Blackarm was very prevalent among the Maiduguri strains. There was very heavy boll shedding in all plots.

4. *Introductions.*—Two new introductions were received from Mr Hutchinson in the Sudan to add to the UA strains reported last year.

No. 502 x Bar Nt 96. UA 8-31.

No. 503 x Bar Sp 84. UA 8-33.

These are both reputed Black Arm Resistant types.

5. *Variety Trial No. A*10 (48).—The main yield trial at Samaru this year included four of the new importations from the Sudan, four of the Samaru selections, and Commercial Allen as control, compared in four randomised blocks on 1/110 acre plots. Yields, etc., were as follows :—

Variety	*% Stand*	*Seed Cotton*		*Ginning %*	*Lint*	
		lbs per acre	*as % of Allen*		*lbs per acre*	*as % of Allen*
26C (Selfed)	80.1	559	93.9	37.5	210	102.9
26E	76.4	579	97.4	38.3	222	108.7
26F	78.3	639	107.4	36.8	235	115.2
26I	76.4	531	89.3	38.2	203	99.5
U.A.7-44	79.8	765	128.5	33.5	256	125.5
U.A.7-33	77.7	483	81.1	30.2	146	71.6
U.A.7-16	83.7	395	66.4	32.6	129	63.2
U.A.7-6	71.3	292	49.1	31.6	92	45.1
Commercial Allen	78.6	595	100.0	34.4	204	100.0
Significant Difference	1%	157.5	—	—	32.4	—
Significant Difference ..	5%	116.2	—	—	23.9	—

With the exception of U.A. 7-44, the new introductions formed a group markedly lower yielding than either Commercial Allen or the Samaru strains, and the latter once more gave consistently higher ginning percentages than all others.

6. *Variety Trial No. W3* (48).—This trial at Daudawa is almost a repeat of W3 (47), but the two varieties N'konala and Oasis have been omitted. Yields are as follows, but it has not yet been possible to analyse the 1948 figures :—

Variety	Seed Cotton lb per acre	Seed Cotton per cent of Allen
26C (Stage 0)	376	124.5
26C (Stage 1)	428	142.0
26C (Selfed)	418	138.4
26E	356	117.9
26F	354	117.2
26G	389	128.8
26H	369	122.2
26I	391	129.5
Commercial Allen	302	100.0

Whereas in 1947, the Samaru strains yielded much the same weight of seed cotton as Commercial Allen, in 1948 they were all very much better than it. Even in 1947, the superior ginning figures for the Samaru strains gave them significantly higher lint yields than Allen, and when the 1948 ginning figures are available, the difference in lint yields in that year should be very high.

7. *Late Planted Variety Trial No. A*11 (48).—As much of the cotton grown locally is planted much later than the optimum date, and on poor land, a trial was laid down to test some of the foregoing varieties as late planted crops on a poorish, unmanured block. The four U.A. 7 strains and selfed 26C were incorporated in six randomised blocks on 1/100 acre plots. Planting was done on 31st July, one month later than A10 (48). Yields, etc., are shown in the following table :—

Variety	% Stand	Seed Cotton lbs per acre	Seed Cotton as % of 26C	Ginning %	Lint lbs per acre	Lint as % of 26C
U.A.7-44	82.2	162	136.1	30.4	49.2	120.6
U.A.7-33	86.7	130	109.2	26.5	34.5	84.6
U.A.7-16	83.1	96	80.7	31.1	30.2	74.0
U.A.7-6	71.3	93	78.1	26.9	23.0	56.4
26C (Selfed)	79.9	119	100.0	34.4	40.8	100.0
Significant Difference	1%	39.4	—	—	13.8	—
Significant Difference	5%	28.9	—	—	10.1	—

It will be seen that the general order of performance is not substantially different from the early planted trial, but a noticeable feature is the consistently lower ginning percentage obtained from the late-planted crop.

8. *Variety Trials—General Summary.*—The above four trials give fairly consistent results, namely :—

(1) U.A. 7-44 has given highest yields of seed cotton and of lint at Samaru when planted at normal time or late.

(2) The Samaru 26 strains have come consistently second to U.A. 7-44 in yield, and have maintained their high ginning per cent. Of these strains, 26F came highest at Daudawa in 1947 and at Samaru in 1948, but has dropped somewhat at Daudawa in 1948. It was in no way outstanding in the School trial (H2 (46)) in 1946.

(3) The remaining U.A. strains have not done much so far, though the position of U.A. 7-33 was better relative to 26C in the late planted than in the normal planted trial.

(4) Commercial Allen seed did better (relative to 26C) in 1948 at Samaru than normally. At Daudawa, however, the usual difference between it and the Samaru strains has been maintained.

9. *Breeding and Selection Work.*—Single plant selection from 26C was restarted during 1947 on the recommendation of Mr Hutchinson who considers that further improvement with 26C itself is possible, particularly the elimination of the " cluster " habit of growth. Fifty-two plants selected from the stage 0 plot of 26C (not selfed) in 1947 were grown as progeny rows in 1948. All but twenty of these were discarded, and the plants in these twenty rows have been selfed. The five best plants from each row were individually recorded and their lint is being individually tested by the Shirley Institute.

10. Local strains of cotton from Maiduguri received very good reports on maturity of fibre, a weak point of 26C, and if further confirmation of this desirable quality is obtained from 1948 fibre tests, these Maiduguri strains will be incorporated in the breeding experiment programme.

11. Normal selfing of selected plants 26C to provide bulked selfed seed for Stage 0 of the multiplication programme was continued.

GROUNDNUTS

12. Thirty-eight local varieties were collected from all parts of Northern Nigeria, and the first stage of selection of new high yielding upright types was started.

13. Trials of earlier selections were carried out, and also of a number of early maturing varieties which may prove suitable for the more northerly areas.

14. *Variety Yield Trial, No. A*4 (48).—In the trials of the Samaru strains during the past few years the relative performances of the best selections have varied considerably from year to year. The present trial contains the eleven best of them, randomised in five blocks on 3/220 acre plots. It will be repeated over a period of several years using these same eleven varieties in an effort to eliminate variation due to season. 1948 results were as follows :—

Variety	*Position in Samaru Trial*				1948 *Yield lbs Kernels per acre*	*Av. Yield per acre* 1946-48*
	1945	1946	1947	1948		
No. of varieties in trial	49	25	25	12	—	—
MG.371	6	4	20	5	510	799
MJ.371	12	2	10	6	495	840
MJ.374..	1	1	7	2	565	883
MK.374	6	5	3	11	392	827
MK.383	9	15	2	7	484	854
ML.372	3	2	15	12	381	785
ML.378	2	8	17	7	484	794
ML.371C	4	12	19	3	559	783
ML.384	4	16	4	10	407	801
K.38	—	6	1	9	455	881
S.38	45	17	5	4	539	828
Castle Cary	48	10	6	1	605	865
Significant Difference	—	—	1%	—	175	—
Significant Difference	—	—	5%	—	131	—

* 1945 yields omitted, as they were based on a very incomplete stand following flooding.

The yields are all very poor in 1948, and the average performance over the three years shows so far little difference between the strains.

15. *Seed pressing Trial, No. A*5 (48).—This trial originated in a letter from the Colonial Office Agricultural Adviser, after discussion of manurial and other questions with a representative of the Imperial Chemical Industries. The latter referred to the value of seed dressing with mercurial dusts as a means of insuring good stands, consequent good early cover and its possible effect on weed growth. In discussion with the Senior Chemist, it was agreed that there was no indication that such dressings were necessary in the case of our groundnuts, as there was no difficulty in obtaining practically 100 per cent stand. However, as a result of the meeting with the Agricultural Adviser, Plant Protection, Ltd., sent samples of two products, one mercurial and one non-mercurial, and it was decided to run a small trial with these. The possibility was considered that by dressing seed, one seed per stand might give a full stand instead of the two seeds at present planted, and thus a halving of the seed rate might be possible. There were ten treatments in the trial as follows :—

(*a*) Type of Dressing : A. Agrosan GN—PP 1551—R4 (containing 1 per cent of organically combined mercury).

B. R 1104 x 49 (non-mercurial, containing 50 per cent tetramethyl thiuramdisulphide).

C. Control—not dressed.

(*b*) Rate of Dressing : A and B each at 2 oz and 4 oz per 100 lb of seed.

(*c*) Seed Rate : the five treatments in (*a*) and (*b*) above each planted at one seed per stand and two seeds per stand.

16. The ten treatments were randomised in four blocks on 1/100 acre plots, but although preliminary analysis shows some suggestion of significant reponse, the detailed examination of the results is not yet complete.

SOYA BEANS

17. Three newly imported varieties, Avoyelles, Acadian and Mamloxi gave promising yields in a preliminary trial, Avoyelles doing particularly well at nearly 1,000 lb of dry beans per acre. Nine other new varieties were received during the year, but have not yet been tested.

SUNFLOWER

18. Selection work was started with a view to selecting a short, high yielding type suitable for local conditions. Three new introductions were also received.

GRAIN CROPS

19. Selection work continued on Guinea-corn and Millet and a number of new Guinea-corn varieties were received from abroad during the year. Selection was also continued among the upland rice varieties, and some hopeful strains emerged from the Atebebu variety.

CASSAVA

20. This is a crop of growing importance in the Northern Provinces, and further work on cultivation methods was carried out. The breeding programme, aimed at producing high yielding varieties, resistant to mosaic disease and hardy enough to withstand the rigours of the Northern dry season, has now reached the progeny-row stage, but yields are not yet known.

GRASSES

21. "*Kyasuwa*" *Strains Yield Trial No. A9* (48).—The 1947 trial (A9 (47)) showed considerable variation in weights of green matter produced by the 25 "strains" of Kyasuwa (*Pennisetum pedicellatum* and near spp.). Nine of these strains were again included in a balanced lattice layout, four replications, in twelve blocks of three. Plots were 3/220 acre. The grasses were sown from seed on 1.7.48, drilled on the top of 3 feet ridges, manured with 1 ton per acre of F.Y.M. Wet weights of green matter per acre were as follows :—

Strain No.	*Approximate per cent cover at harvest*	*Yield lb per acre*	*Yield adjusted for 100 per cent cover*
1	92	18,280	19,870
10	85	16,090	18,930
Local	100	15,640	15,640
8	92	15,280	16,600
21	72	14,150	19,650
18	68	13,140	19,320
13	68	11,120	16,350
11	82	9,080	11,070
17	52	6,730	12,940
Significant Difference	1%	2,576	—
Significant Difference	5%	1,804	—

Strains 1 and 10 again did well, but strain 21 has dropped from easy first to fifth place. This is accounted for mainly by a very poor establishment on two of the four plots of this strain, and adjustment to 100 per cent cover puts it in the high yielding group again. The unselected local mixture *ex* Shika, included as a check, gave a high yield, in part accounted for by the excellent establishment of this strain. On the two years' trial, it appears likely that strains 21, 10 and 1 represent an improvement on unselected kyasuwa.

HERBARIUM

22. Over 500 new specimens have been added during the year; over 200 grass specimens have been mounted and named, and a further 100 have been sent to Kew for identification.

MASKA FADAMA FARM

23. A site has been obtained and preliminary work carried out in the establishment of a farm at Maska fadama, where crop investigations under irrigation will be carried out. It is also intended by the use of this irrigated farm to speed up breeding and multiplication work on all crops by taking two or even three crops in a year.

J. H. Gisborne,
Botanist

VII. Report of the Chemistry Section, 1948

1.—STAFF

During the year Senior Staff has been reduced from five to two. Mr K. T. Hartley and Mr W. A. Watson, Senior Agricultural Chemists, departed on leave prior to retirement in October, 1948 and March, 1949 respectively, whilst Dr H. Vine, Agricultural Chemist, who proceeded on leave in May, 1948 was seconded to the Gold Coast with effect from 19th October, 1948. No new appointments have been made.

Junior Staff has been strengthened by the appointment of one Agricultural Assistant from the Ibadan School of Agriculture and one from the Zaria School.

2.—SOIL INVESTIGATIONS

Following last year's reconnaissance surveys of the parts of Bornu and Niger Provinces recommended for development by the Groundnut Mission a more detailed survey was made in January, 1949, of the Mokwa district of Niger Province which has been selected as a suitable site for operations. The area surveyed covered approximately forty square miles. It is estimated that deep sandy soils suitable for groundnut cultivation occupy about 75 per cent of this area : the remainder consists of a heavier soil suitable for guinea-corn, yams, etc., concretionary soils being found only in relatively small areas in three traces.

A detailed soil map of the grounds of the Ibadan University was begun, and a survey was made of the Agatu Mechanisation Scheme. Two surveys were made for the Rice Mission, one at Bakoji (Benue) the other at Bagaji (Niger). At both the Ibadan and Samaru (Zaria) laboratories soil analyses have been made in connection with the above surveys. Samples have also been examined from new experiment farms in Ondo, Abeokuta, Ijebu, Niger and Bornu Provinces and from a collection made by the Geographer in the course of erosion studies on the Plateau.

On behalf of the Rice Mission measurements of soluble salts have been made in soils from the Lake Chad area : the examination of a preliminary series of surface samples has so far given no indication of excessive salinity.

3.—FIELD EXPERIMENTS

Curtailment of the experimental programme in the South has been enforced by the need for the Agricultural Chemist, Ibadan, to undertake soil surveys both in the North and South and by the large-scale operations needed for the production of commercial samples of *Tetracarpidium* kernels. It has not been possible to station a chemist at O.P.R.S. In the North, where two chemists have been stationed during a greater part of the year, a fuller programme has been possible.

At Moor Plantation, Ibadan, applications of fertilizers have again been made to the yam and early maize crops of Rotation P. With both crops significant increases of 57.8 per cent and 77.2 per cent respectively resulted from a combined application of nitrogen and phosphate. No single fertilizer gave a significant increase with yams, but with maize nitrogen gave an increase of 55 per cent and phosphate of 24 per cent, the

difference between the two responses being significant : there was no response to potash. No residual effect was obtained from fertilizers applied last year to Rotation P or from farm yard manure applied to Rotation R.

In the Eastern Provinces trials of nitrogen, phosphate and potash at varying levels were carried out at seventeen sites, mostly on farmers' land. The experiments are described in detail at page 5, section III. With both yams and maize the chief response has been to nitrogen : occasional large increases due to potash have been recorded, but phosphate appears to have had little effect except in combination with nitrogen. A number of demonstrations of the beneficial effects of liming were given, and simple apparatus for testing lime requirement was issued from the Ibadan laboratory.

At Samaru, Zaria, experiments in the placement of phosphatic fertilizers with groundnuts have been continued, using pellets of bone phospate, non-ammonium phosphate, ordinary (18.5 per cent) and triple (45 per cent) superphosphate, all containing the equivalent of 11 lb P_2O_5 per acre. Possibly on account of its higher calcium content ordinary superphosphate has proved markedly superior to the other phosphates, particularly in the production of foliage. The experiments have shown :—

(1) that accurately dibbling the pellet 1½ inches from the seed has no advantage over the toe and heel placement recommended to the farmer ;

(2) that the same significant increase is obtained whether pellets are placed ½ inch, 1 inch or 1½ inches from the seed ;

(3) that in the case of superphosphate powder and triple pellets there is the same response whether fertilizers are applied at the time of germination or at periods extending up to thirty days after germination.

The last point is of importance as some farmers have said they would prefer to apply the fertilizer to young seedlings rather than at planting time, when there is a peak demand for labour.

At the new Groundnut Farms at Kontagora (Niger) and Damaturu (Bornu) very gratifying response to superphosphate has been obtained. At Kontagora, where the landed cost of superphosphate is roughly equal to the price of groundnuts (£20 per ton), a dressing of 50 lb superphosphate gave an increase of 359 lb kernels per acre, a sevenfold return on the cost of fertilizer. Whilst at Kontagora small applications of ammonium sulphate had as pronounced an effect as superphosphate, similar applications reduced yields at Damaturu and caused a significant depression in shelling percentage, probably accentuated by the abnormally short duration of the rains. At Kontagora significant increases in kernel and haulm weights resulted from dusting flowering plants with gypsum at 100 lb per acre. Pellets of triple super were issued to ten groundnut farmers in each of seven widely separated areas. Results were encouraging, the most consistently successful being obtained in Bornu Province where the mean extra return was 175 lb kernels per acre. Pellets of ordinary superphosphate are now being prepared to replace triple super in the coming season, when it is hoped to enlist the help of upwards of 400 farmers in trials with both guinea-corn and groundnuts.

Twenty cotton farmers at Daudawa collaborated in successful trials of superphosphate powder and triple super pellets : twenty tons of superphosphate are to be issued to Daudawa farmers in the coming year.

Close touch has been maintained with experiments made on the Plateau in connection with the rehabilitation of abandoned tin workings, assistance being given to A.O. Plateau in the design of trials with composts fertilizers and cover crops.

4.—OIL SEEDS

The process evolved by Hartley for the preparation of kernels of *Tetracarpidium conophorum* was again employed in the preparation of nine sample forwarded for examination by Dr Hilditch of Liverpool University. The samples proved to be the best yet prepared : the mean oil-content was 48.5 per cent whilst the F.F.A. was only 0.54 per cent. No increase in F.F.A. during transit had been observed in the first samples to reach Dr Hilditch.

A request by the Board of Trade for a consignment sufficiently large to yield 50 gallons of oil severely taxed the resources of the Ibadan laboratory during the period July to September, 1948. 758 lb of kernels, expected to yield 30 gallons of oil, were prepared by passage through electric ovens to kill the lipolytic enzyme after preliminary drying and cracking of the nuts by heating them in pots containing sand. The material had a mean oil-content of 48.5 per cent and an F.F.A. of 0.94 per cent, the latter value being considerably lower than that of the smaller samples prepared in previous years.

Experiments were made on the development of F.F.A. in non-treated kernels. After a slow initial rise from 0.30 per cent to 1.24 per cent in the first two weeks there was a rapid increase to 6.0 per cent at three weeks and 64 per cent at eight weeks.

At the Zaria laboratory the regular testing of groundnuts stored at Kano was continued until July, 1948 when the work was taken over by the Pest Infestation Survey. F.F.A. both in broken and entire kernels remained at a low level during the dry months but increased sharply when humidity rose in April. Samples collected in July contained 3.4 per cent F.F.A. in entire kernels, 7.6 per cent in half kernels and 13.2 per cent in fragmentary material.

5.—MISCELLANEOUS

At Ibadan regular determinations of feeding value were made on samples of elephant grass cut at various intervals, whilst at Zaria monthly analyses have been made of Gamba grass collected at Yandev (Benue). It was found that Gamba grass regularly cut at intervals of one month maintained a protein content of 8 per cent during the seven months of sampling whilst the content of uninterrupted growth gradually declined to 2 per cent. A similar decline in phosphate content was observed whilst calcium remained unchanged. These results are in agreement with previous work on Gamba grass at Samaru.

Of a number of samples of limestone examined at Ibadan during the year none was found suitable for lime burning. The analysis of butter-beans (*Phaseolus* spp.) recommended for export showed them to contain a higher percentage of hydrocyanic acid than that permitted by United States Regulations.

A field laboratory was again established in Southern Zaria in February, 1949 and certificates of analysis were issued in respect of purchases of ginger. The yellow ginger now exclusively marketed appears to have reached a uniformly high quality : all pre-market and market samples examined were well above the prescribed standard.

M. Greenwood,
Senior Agricultural Chemist

VIII. Report of the Entomological Section, 1948

STAFF AND GENERAL

Mr A. Pickles assumed duty as Entomologist on transfer from Trinidad and Tobago on the 14th April, 1948. Mr J. T. Davey was on vacation leave from 2.6.48 to 1.12.48. The Empire Cotton Growing Corporation posted one of their Entomologists, Mr Q. A. Geering, to Nigeria for special investigations on cotton pests in the commercial cotton producing areas of the Northern Provinces. Mr Geering who arrived on 16.6.48, is stationed at Zaria and a resume of his work appears later in this report.

2. Mr F. O. Iwenjora, Assistant Agricultural Officer, was seconded as assistant to Mr Geering from the time of the latter's arrival in Nigeria and resumed his substantive duties on 7.3.49. Mr Akibola, Agricultural Assistant, Grade II, retired from the service with effect from 18.3.49 and Mr Bolumole, Clerical Assistant, resigned for reasons of health on the 19th March, 1949. On account of shortage of staff, the West African Pest Infestation Survey applied to this Section and the services of Mr H. O. Achike were loaned to the Survey for a period of seven months. This arrangement not only provided badly needed assistance to the Survey but also enabled a member of the staff of this Section to acquire a knowledge of the biological and chemical techniques employed in the investigation of pests of stored products. One addition to the staff was made by the recruitment of a Field Overseer in the course of the year.

3. The Section continues to work under difficulties arising from shortage of equipment and materials, which can only be remedied slowly in the existing supply situation.

LOCUST PROBLEMS

4. At the present time, populations of locusts, apparently permanent, occur only in fairly well-defined areas of Bornu and Adamawa Provinces. As these are the sole areas in Nigerian territory in which locust outbreaks can conceivably originate, they are kept under special surveillance throughout the year by local locust scouts. In addition, annual visits are paid by an entomologist for more detailed study of the resident locust population than is possible by the scouts. Mr J. T. Davey is in charge of this work and the observations which follow are abstracted from his reports.

Migratory Locust (*Locusta migratoria migratorioides*, R and F)

5. Although numerous small bands of *Locusta* had been observed and destroyed in the area during the preceding year, a special survey of the Balala District of Adamawa Province, made in January, 1948, failed to disclose the presence of locusts of any phase and none has been observed since. The available information, nevertheless, leaves no room for doubt that these outbreaks originated from a resident population of solitary locusts and not from the progeny of recent invading swarms.

6. In the vicinity of Lake Chad in February, 1948, speciments of *Locusta* were found in the usual habitats, but the numbers were fewer than in 1947. Nevertheless many of the individuals were in the *transiens* phase (*i.e.*, intermediate in form between solitary and swarming phases). The survey of February-March, 1949, showed that locusts were still fewer in numbers than in 1948 and only fifteen specimens were observed throughout the investigation. Of these one specimen appeared to be in the *transiens* phase.

7. Two locust outbreaks were reported during the year 1948, both from North-Eastern Bornu. The first of these occurred in October, when a small hopper band was discovered twelve miles east of Marte and was destroyed. The second outbreak occurred at Grille and the hoppers were mistaken by the natives for solitary grasshoppers. The swarm was attacked by the villagers but disappeared in an easterly direction towards French territory. No signs of breeding could be discovered when the site of the outbreak was examined in March, 1949.

Red Locust (*Nomadacris septemfasciata*, Serv.)

8. The survey of 1948 showed that populations of the Red Locust had declined considerably since the preceding year; in 1949 they had decreased still further and were found in the neighbourhood of the Mugdala fadama only.

Desert Locust (*Schistocerca gregaria*, Forsk.)

9. The Desert Locust was not reported during the period under review.

Tree Locust (*Anscridium moestum moestum*, Wlk)

10. Swarms of this species were first recorded in 1946, since when many instances of swarms have occurred in the Northern Provinces. The tree locust is rarely injurious to economic plants but it is frequently mistaken for the Migratory Locust and leads to confusion of reports unless these are accompanied by actual specimens. Tree Locusts were abundant in Adamawa Province during 1947 at the same time that swarms of *Locusta* occurred in that region; a swarm was also recorded in this area in June, 1948. Another outbreak of this species occurred in Sokoto Province in January, 1949, where slight damage to tobacco and perennial cotton was reported.

COTTON PROBLEMS

11. Pest problems of commercial cotton in the Northern Provinces are the special study of Mr Geering, the Entomologist appointed by the Empire Cotton Growing Corporation. The entomological problems of cotton in the North are principally those connected with bollworm injury but depreciation of quality following attack by cotton stainers is also an important factor.

12. This investigation has the following main objectives :—

(*a*) to assess the damage caused by the several pathogens;

(*b*) to investigate the details of the life histories of the pests concerned, especially in relation to climatic factors of the environment and to the seasons of the year;

(*c*) to investigate possible methods of control. An important feature of the investigation is a study of the present and probable future status of the Pink Bollworm, which was discovered in the cotton belt of the Northern Provinces in 1943.

13. From examination of individual locks from large numbers of ripe bolls at four observation stations, Mr Geering derives the following estimate of injury due to the several factors, expressed as the percentage number of locks affected by each :

Grade	*Stations*			
	Gusau	*Daudawa*	*Samaru*	*Kontagora*
Clean	50.2	74.9	74.9	50.7
Damaged by bollworm ..	18.2	6.2	11.0	8.7
Stained	22.8	11.2	10.3	26.9
Affected by boll disease ..	8.8	7.7	3.8	13.7
Yield per acre (lb) ..	272	316	503	—

14. Bollworm damage recorded above is due to insects of several species and the proportion of the total damage caused by each, varies from station to station. Thus, at Gusau 66 per cent of the total bollworm damage was due to Pink Bollworm, while at Kontagora most of the injury was due to the Red and Spiny Bollworms.

15. In relation to control measures, the proportion of the pest population which enters a diapause or resting stage is of fundamental importance. It is of interest to record that at the end of the season, Mr Geering found diapause larvae amounting to 13,000 per acre at Gusau and 3,400 per acre at Samaru ; the number of resting larvae remaining in the field after the completion of harvesting was estimated at 1,316 and 677 per acre respectively at these two stations. The numbers of diapause larvae in seed taken to ginneries and local stores are also being investigated and their survival until the next planting season is being studied.

16. While the Pink Bollworm has a diapause larva, the Red Bollworm (*Diparopsis*) rests as a pupa. In both cases there is a progressive increase in the proportion of diapause individuals as the season advances, as is shown by Mr Geering's tabulated results reproduced below :—

Week Ending	*Diapause Pupae of Red Bollworm (per cent)*	*Diapause Larvae of Pink Bollworm (per cent)*
October 17	40.0	0.0
October 24	86.7	—
October 31	95.3	12.5
November 7	91.5	—
November 14..	98.0	21.8
November 21..	—	—
November 28..	100.0	62.6
December 5	—	—
December 19	—	83.5
January 2	—	93.0
January 9	—	100.0

17. The results already show clearly that the enforcement of a rigid close season in the commercial cotton belt is essential if the losses due to bollworms are to be reduced appreciably.

18. In the Western Provinces, cotton is liable to attack, at an early stage of growth, by the Capsid bug *Helopeltis sanguineus*. Attack by this pest may result in early death of the plant, in severe distortion of the growing points so that no crop is produced, in shedding of flowers and young bolls or in the production of a high proportion of " mummified " bolls, according to the severity of the infestation and to the stage of growth of the plant when the attack takes place.

19. Plants which survive such an attack to produce a crop are also subject to injury by bollworms, stainers and other pests but, owing to the time of occurence and the nature of attack by *Helopeltis*, the first step in a programme of pest control must be the reduction of capsid damage which, at Moor Plantation in particular, is so severe as to render selection and multiplication work extremely problematical.

20. E. O. Pearson, in his " Report on a visit to Nigeria " (1947) observes that peasant cotton, grown under early partial shade, appears to suffer less from attack by *Helopeltis* than does cotton grown in pure stand. An experiment was accordingly

conducted to compare the effects on *Helopeltis* attack and on yields of spraying with DDT and of providing partial shade as against no treatment. As this experiment was of an exploratory nature, DDT was applied on three occasions in 5 per cent suspension which is probably an uneconomic rate. The following four treatments were compared : (*i*) No treatment (*ii*) sprayed, no shade (*iii*) unsprayed, shaded (*iv*) shaded, sprayed.

21. All plants grown under the shade of early maize suffered severely from water shortage and growth was very poor until the maize matured. *Helopeltis* injury was not particularly severe on these plants but the total growth was much less than that of plants grown in the open. Plants grown without shade and not subjected to spray treatment were very severely attacked by *Helopeltis*, while *Helopeltis* injury was slight on those which had been sprayed.

22. The maximum numbers of insects per plant recorded during the season were as follows :—

(*i*) Unshaded, unsprayed	0.2
(*ii*) Unshaded, sprayed	3.2
(*iii*) Shaded, unsprayed	1.2
(*iv*) Shaded, sprayed	0.9

23. Yields of cotton lint and seed differed markedly according to treatment and were as follows :—

Treatment	*Lint* (*lb/acre*)	*Seed* (*lb/acre*)
(*i*)	13	14
(*ii*)	35	53
(*iii*)	7	7
(*iv*)	5	10

24. A yield of seed cotton amounting to only 88 lb per acre, which was the highest yield obtained, cannot be regarded as satisfactory and it is evident that some factor other than injury by *Helopeltis* was also limiting yields. Nevertheless the experiment demonstrates that control of *Helopeltis* by means of insecticide is definitely possible and that a definite and substantial increment in yield is obtained when the pest is controlled.

CHRYSOPS INVESTIGATIONS

25. *Chrysops spp.* are of importance in Nigeria chiefly as vectors of filariasis. The problem is consequently a medical rather than an agricultural one. The incidence of filariasis, however, severely limits the agricultural communities of large parts of Southern Nigeria and is a problem of some magnitude at the Oil Palm Research Station, Benin, where numerous cases of infection have occurred amongst persons stationed there, both European and African.

26. During the year 1948, attempts were made to define the characters of the breeding grounds of *Chrysops*, particularly of *C. silacea* and *C. dimidiata*, which are known to be vectors of filariasis. From the examination of a long series of soil and mud samples taken from a great variety of sites within and adjacent to the suspected breeding ground, it appears that the larvae breed mainly in saturated mud with a high content of organic matter and without free water at the surface. Presence or absence of shade, the nature of the vegetation immediately around the breeding site and the reaction of the medium appear to have little or no influence in determining the suitability of the site for the survival of *Chrysops* larvae.

27. The number of adult flies captured uninjured was most unfortunately insufficient for critical observations to be made on the flight range of the insects and on the infection rate. In an attempt to determine how far from the breeding ground the adult insects would fly and thereby to delimit the area of the course of the Okhuo River requiring treatment for the protection of the inhabitants of the Station, living flies were liberated at various points after having been lightly sprayed with Methylene blue solution for purposes of identification : none, however, was recaptured. Filarial parasites were occasionally observed in and on the mouth parts of adult insects, but the number of observations possible was too small to enable an estimate to be made of the proportion of the population which was infected.

28. The incidence of *C. silacea* and *C. dimidiata*, as shown by routine collection, was similar to that observed in the two preceeding years :—

	May	*June*	*July*	*August*	*September*	*October*	*November*
C. silacea ..	24	25	24	18	22	6	8
C. dimidiata ..	38	51	35	54	82	224	101

TOBACCO PROBLEMS

29. Tobacco leaf curl disease was unusually severe and widespread during 1948 at Ago-Are in the Western Provinces and white flies, presumably vectors of the disease, persisted to the end of the year. This resulted in a serious loss of revenue to the growers and to the Company which purchases and manufactures their produce. While it must be admitted that detailed investigation of the identity of the vector or vectors and of the nature of alternative hosts of both vector and virus is necessary, plans were discussed with the Company's representatives to prevent, as far as possible, the recurrence of similar losses in 1949.

30. The protracted activity of white flies in 1948 is probably related to the low wet-season rainfall of that year and similar conditions are unlikely to occur two years in succession. As an *ad hoc* measure, therefore, it was believed that protection of the crop during the early stages of its growth might suffice in a normal year to restrict the incidence of disease, particularly since a high density of vectors appears to be necessary to reproduce the disease symptoms. Accordingly, it was recommended that the Company's nurseries should be kept as free as possible from white flies in order to ensure that plants distributed to farmers should be free from disease and routine spraying or dusting with pyrethrum has been adopted for this purpose.

ALAN PICKLES,
Entomologist

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